Rock Products

With which is Incorporated CEMENT and ENGINEERING NEWS

Founded 1896

Chicago, November 15, 1924 (*Issued Every Other Week*) Volume XXVII, No. 23

ELECTRIC
Manganese Steel
FURNACE

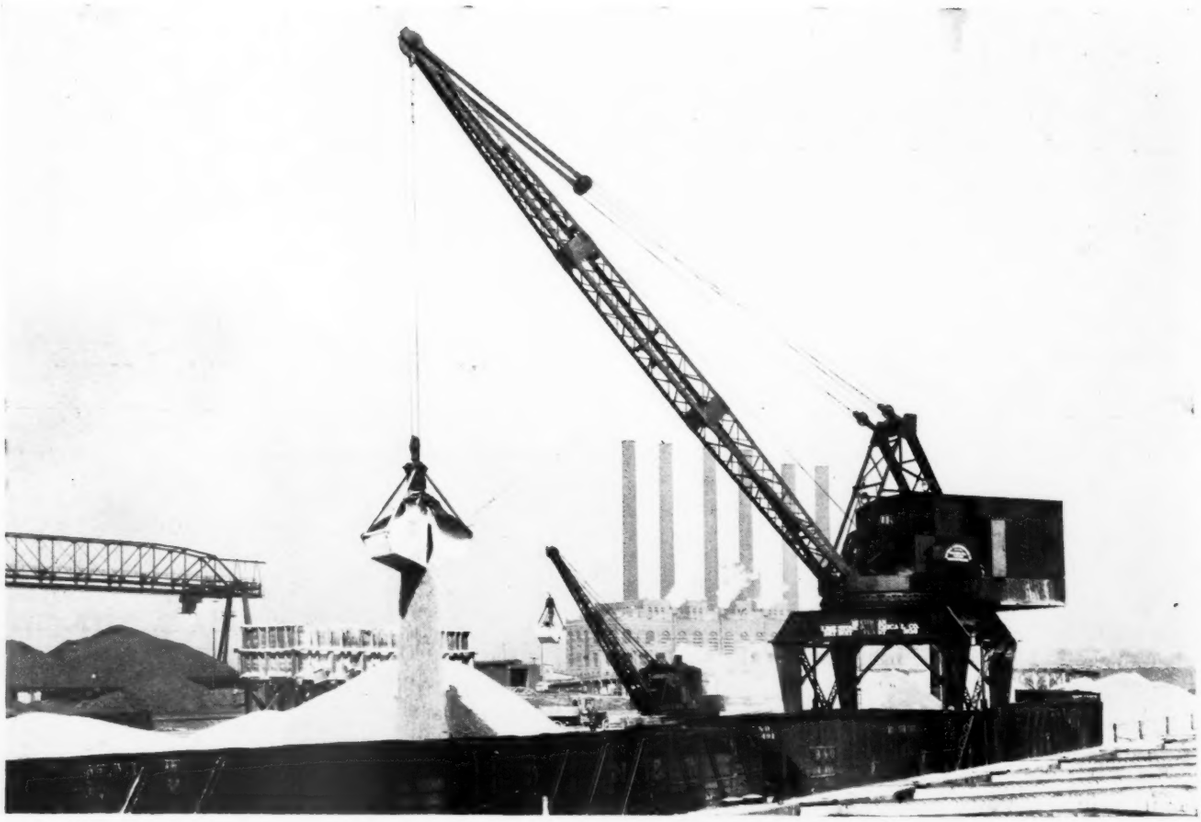
Chains-Buckets
and
Repair Parts that are Made to Resist Wear

Fifth *and* Penn

MOORE & MOORE, Inc.

Reading Pa.

MEMBER A.B.C. *The Only Paid Circulation in this Industry* MEMBER A.B.P.



Who Uses the O-S?

- Alpha Portland Cement Co.
- Atlas Portland Cement Co.
- Cemento La Tolteca
- Dewey Portland Cement Co.
- Hercules Portland Cement Co.
- Indiana Portland Cement Co.
- Kelley Island L. & C. Co.
- Lehigh Portland Cement Co.

We are printing here a partial list of O-S Dependable users. Some of these big organizations ***standardize*** on O-S equipment.

Personal sentiment does not enter into the working arrangement of big business. It is purely a matter of receiving 100 cents or more in value for every dollar spent in equipment, and when these organizations come back to us time and time again, the proof of the durability, the economy and the service of our equipment is evident.

- Michigan Limestone & Chemical Co.
- New Egyptian Portland Cement Co.
- Peerless Portland Cement Co.
- Phoenix Portland Cement Co.
- Pyramid Portland Cement Co.
- Sandusky Portland Cement Co.
- Universal Portland Cement Co.
- U. S. Gypsum Co.

ORTON & STEINBRENNER CO

CRANES ✣ BUCKETS ✣ SHOVELS

608 South Dearborn Street **Chicago, Ill.** **Factory: Huntington, Ind.**

When writing advertisers, please mention ROCK PRODUCTS

Rock Products
With which is Incorporated CEMENT and ENGINEERING NEWS
Founded 1896

Vol. XXVII | Chicago, November 15, 1924 | Number 23

Rock Products Activities in the East

Two New Vermont Lime Plants—Albany Crushed Stone Company's Plant — Launching of the Keystone Sand and Supply Company's All-Steel Dredge "Pittsburgh"

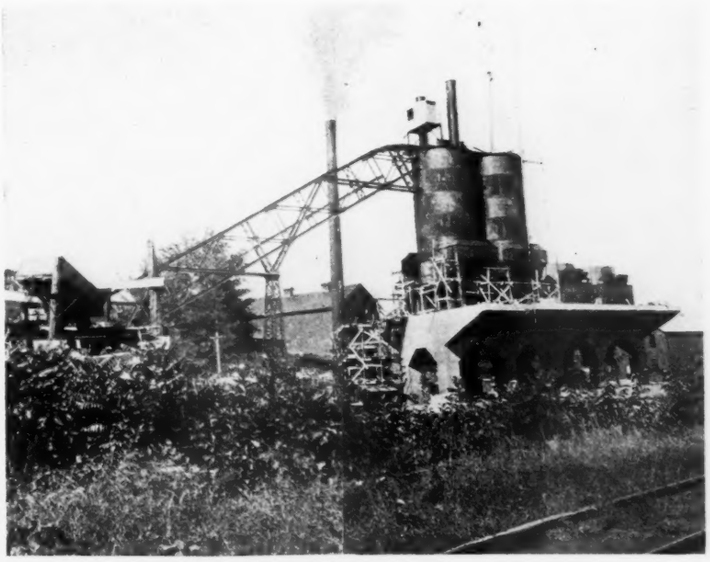
By Nathan C. Rockwood
Editor-Manager, Rock Products

WHAT is in many ways one of the most remarkable lime plants in the United States is under construction at Winooski, Vt., for the Champlain Valley Lime Co. (the Brewer & Co. interests of Worcester, Mass.).

We referred to it briefly in ROCK PRODUCTS of October 4. This plant comes as near to being automatic in operation as any shaft lime kiln plant ever built, so far as we know.

It has automatic coal-handling equipment, automatic stokers, special furnaces, pneumatic drawing equipment, conveyors for handling lime, etc. The kilns themselves incorporate a number of novel ideas, which are the joint products of the designer, John C. Schaffer, president of the Schaffer Engineering Co., Pittsburgh, Penn., and R. W. Foster, manager of the Champlain Valley Lime Co. Moreover, the kilns are of very large size and their capacity is expected to exceed that of any shaft kilns in the industry.

The view herewith was taken the latter part of September at the time of the writer's visit. Since then one of the kilns has been fired and the results have been very gratifying to the manager. Of course it is too early to get any idea of the actual capacity under ordinary operating conditions, fuel economy, etc., but, so far, we are reliable informed, the kilns give every indication of living up to the builders' expectations.



New plant of the Champlain Valley Lime Co., Winooski, Vt.

Among other noteworthy points, brought out in the accompanying view, is the substantial manner in which the plant is constructed. It is reinforced-concrete and steel throughout — absolutely fireproof. The cantilever kiln base and firing floor construction is rather unique.

Ample limestone of very high calcium content is available from two quarries.

Four views herewith show another new Vermont lime plant, designed and built for the Leicester Lime Corporation at Leicester Junction by Arnold & Weigel, Woodville, Ohio. This is a very old lime manufacturing operation, one old kiln dating back at least 50 years. It was bought by its present owners about two years ago and a battery of three modern Arnold kilns was erected during the present season.

The lime made here is a high calcium chemical lime, which is said to run around 98% CaO. A modern hydrate mill is under construction.

The main office of this company is at Brandon, Vt. A. F. Mariglioni is general manager and active head of the plant. J. F. Linder, Sr., of Linder & Meyer, Boston, Mass., is president; George von L. Meyer is vice-president and treasurer, and J. F. Linder, Jr., is assistant treasurer and sales manager.

Albany Crushed Stone Company

It was the writer's good fortune to visit the plant of the Albany Crushed Stone Co., at Feura Bush, Albany county, New York, on a beautiful fall day, and a few days after "Sam" Russell, of E. I. du Pont

de Nemours & Co., had fired the opening blast. This blast, by the way, was unusually successful for the purpose intended and a fine quarry face is exposed.

This plant in many respects is one of the most spectacular crushing plants in the country. It is located on a side hill with the quarry floor about 400 ft. above the West Shore railroad tracks in the Hudson valley below. The quarry floor is shale and above it rises a limestone bluff 100 ft. high.

with a fourth crusher, a 13-in. Superior McCully gyratory, so that all material reaching the 42-in. conveyor belt from both scalping screens is 2½ in. or less.

The sizing plant is built over bins and is a screening plant pure and simple, no provision being made for recrushing any sizes made there.

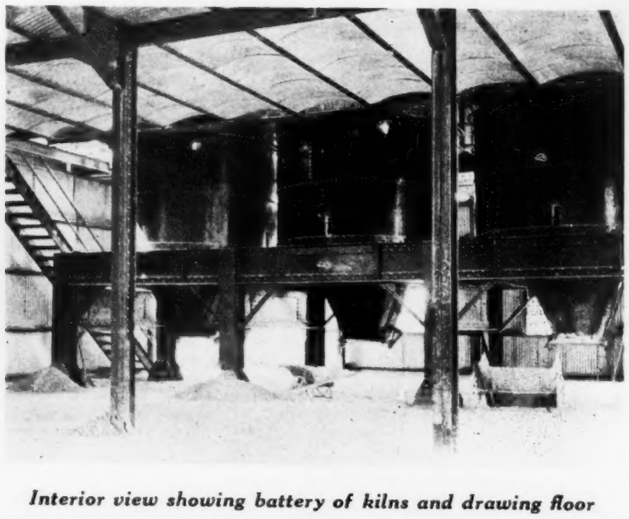
Electric Quarry Shovel

The quarry operation is particularly interesting because the shovel used is one

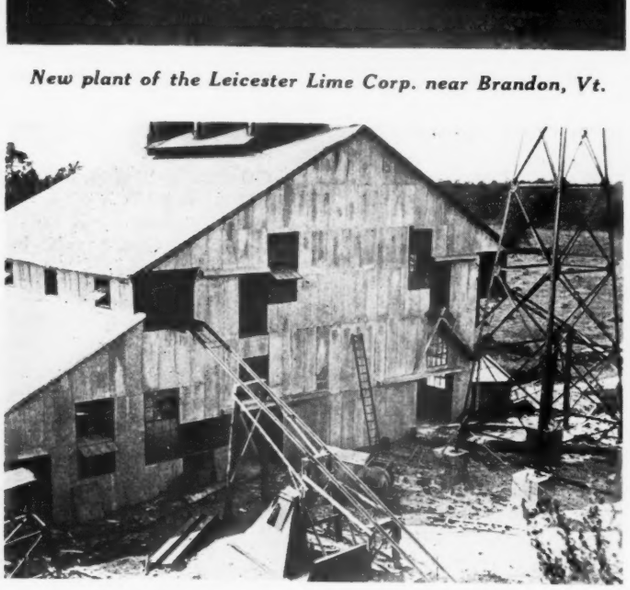
road. There is an incline railway beside the plant, operated by an electric hoist at the top. The shovel was backed up partly by use of its own power, and partly with the help of the hoist line.

The Albany Crushed Stone Co. is a new enterprise promoted by J. Harris Loucks, a prominent Albany attorney. The plant has been under construction for nearly two years. It was originally capitalized at $200,000. The plant as it now stands is reputed to have cost about $400,000.

New plant of the Leicester Lime Corp. near Brandon, Vt.



Interior view showing battery of kilns and drawing floor



Leicester Lime Corp. lime plant under construction

Interior view of the firing floor of plant

The primary breaker, a 42-in. Superior McCully gyratory, is set with the opening slightly below the quarry floor level. Passing this crusher all material goes through a scalping screen, the oversize going to two 16-in. Superior McCully gyratory crushers. All rock that passes the scalping screen (2½-in. ring) drops directly to the 42-in. belt conveyor, which takes it to the screening building below and 400 ft. distant.

After passing through the secondary crushers the rock passes through a secondary scalping screen in the crusher house, which operates in closed circuit

of the newest types of Marion Model 93 electrics with crawler treads. It is shown in the accompanying views overcasting material on the side hill for a working space. No stone had been made at the time of the writer's visit. This shovel takes a.c. current 2200 volts.

The drilling is also done with electric well-drill equipment made by the Loomis Machine Co.

For stripping an Erie revolving steam shovel Type B is used. The view herewith shows the rather interesting operation of getting the shovel to the quarry floor level, avoiding a roundabout wagon

It is expected that the company will have a large railway ballast business as it is located close to the new Hudson River Connecting R. R. tracks and the great freight classification yards of this railway. This is a subsidiary of the New York Central Lines and was built to provide a cut-off for freight around the city of Albany.

Launching of the Dredge "Pittsburgh"

On Thursday, October 30, the writer was a guest of the Dravo Contracting Co. and the Keystone Sand and Supply Co. near Pittsburgh, Penn., on the occasion of the launching of the sand company's new

Plant of the Albany Crushed Stone Co., Feura Bush, New York

all steel ladder dredge "Pittsburgh"—the second largest dredge of its type ever built at these works. The accompanying view is an amateur's attempt to catch the new dredge as it dipped the water for the first time, but as the river was steeped in fog, thickened with the well-known Pittsburgh smoke, the view is artistic rather than descriptive.

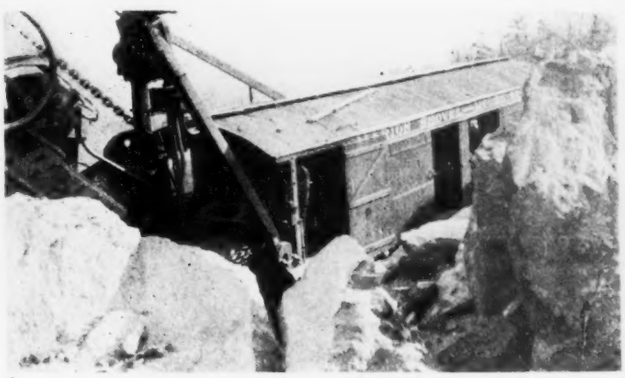
Fortunately, a dredge of similar type and size, practically finished and equipped, the No. 4 dredge for the Ohio River Sand and Gravel Co., Louisville, Ky., was ready for inspection—in fact the machinery was turned over for the first time on this day. A full description of this dredge will appear in a forthcoming issue.

The launching was followed by a luncheon at the dancing pavilion of the Dravo Construction Co., Neville Island, where the company was host to the many visitors and spectators.

Prominent officials of the city of Pittsburgh were present at the launching, including Mayor William Magee, Daniel Winters, president of the Pittsburgh council, and W. Y. English, Wallace Borland, John S. Herron and P. J. McArdle, councilmen; Joseph G. Armstrong, James G. Houlahan and Addison C. Gumbert, Allegheny county commissioners; Norman P. Brown, director of public works of the city of Pittsburgh; Major E. L. Daley, United States district engineer. Also many sand and gravel producers and building supply dealers.

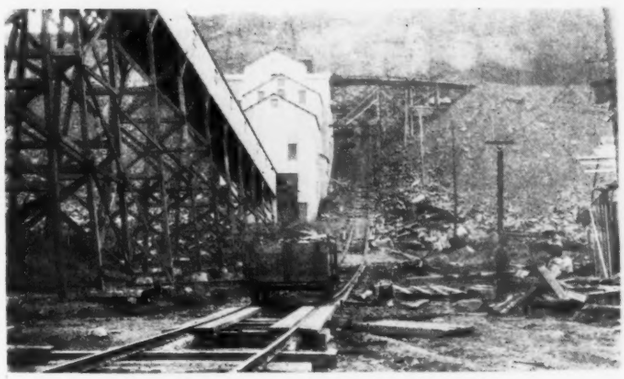
New York State Stone Meeting

The return trip home included a day spent with the New York State Crushed Stone Association at Buffalo. As usual with these meetings, the forenoon was spent in inspection trips to nearby quarries—in this case the Buffalo Crushed Stone Co. and the Buffalo Cement Co. plants.



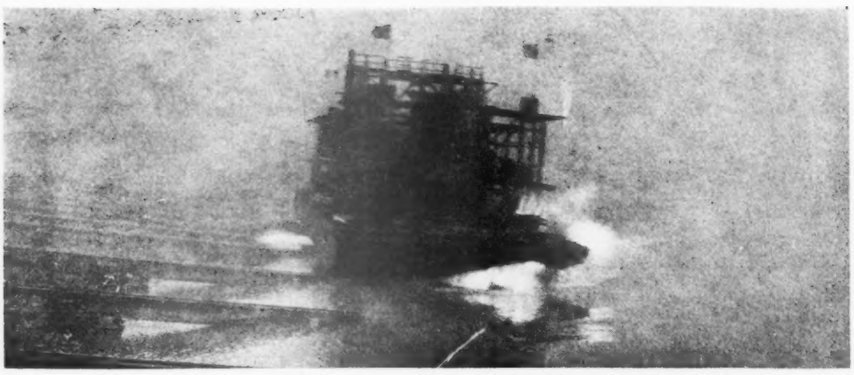
Crawler-tread 93-ton electric quarry shovel

Taking a steam shovel on top for stripping



Incline railway used during construction to move machinery and construction material to quarry floor level

Another view of electric shovel showing a view of the Hudson River valley and West Shore freight yard



New all-steel dredge of the Keystone Sand and Supply Co., Pittsburgh, Penn., taking its first dip in the Ohio river at Neville Island on October 30

The meeting was one of the best attended that the association has held. Western Pennsylvania quarrymen were invited and several were present. A good part of the meeting was devoted to a discussion of the freight-rate situation, as viewed by Otho M. Graves, chairman of the railway committee of the National Crushed Stone Association.

The quarry industry of this section has enjoyed a good season. The fine weather through October resulted in record outputs and record-breaking demands.

This meeting was held before the recent election—but even then all were optimistic over the outlook for another year. Chas. A. Freiberg, general manager of the Buffalo Cement Co., by the way, was a candidate for re-election to the New York State Assembly. As he is a republican we presume he won.

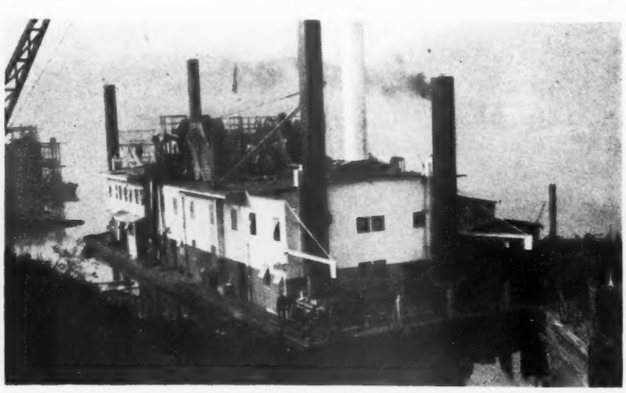
Captain H. Duffy of the Ohio River Sand and Gravel Co., Louisville, Ky., and his new command

We Should Build Broad Roads

"ULTIMATELY," says Pennsylvania, "the Lincoln highway will be a 40-ft. pavement entirely across the state." Speaking through Secretary Wright of the state highway department, Pennsylvania has made clear that the broad highway must follow immediately after the long highway. The trunk lines must be double tracked. When her 5000 mile road program is finished, Pennsylvania will begin widening those roads.

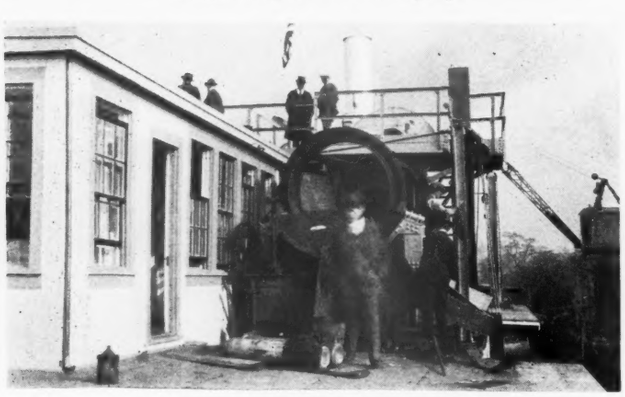
The broad highway is the most pressing need in the Illinois road program. A densely congested pavement, so far as transportation value is concerned, is little better than an open road of dirt. Congestion on the roads within 70 miles of Chicago destroys most of their transportation value on heavy days.

The great trunk lines out of Chicago should be widened to a minimum of 36 ft. for a distance of 70 miles or more. The Rand road, Lake street, Roosevelt road, Sheridan road, Waukegan road, Western avenue, the Dixie highway, Milwaukee road, the River road, Archer road, the Fox River road and the Lincoln highway are a few of the great roads out of Chicago or in the Chicago district that should not be less than 36 ft. wide.—*Chicago Tribune.*

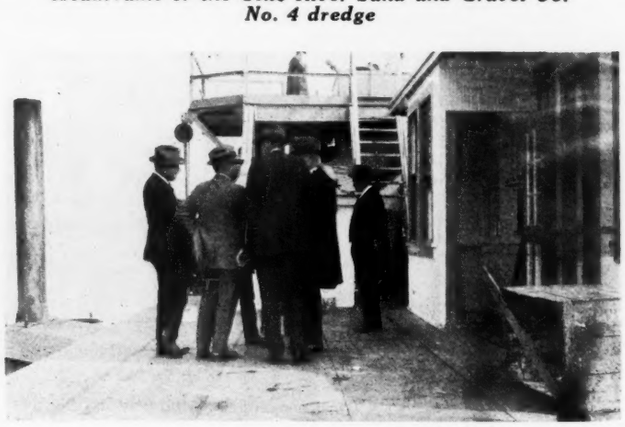


No. 4 all-steel dredge of the Ohio River Sand and Gravel Co., of Louisville, Ky.

Headframe of the Ohio River Sand and Gravel Co. No. 4 dredge



Some of the screening equipment on the Ohio River Sand and Gravel Co. dredge No. 4



Sand and gravel celebrities discussing the merits of the new Ohio River Sand and Gravel Co. dredge

Effect of Composition on Some Properties of Gypsum Plaster*

By F. C. Welch
Research Fellow, the Gypsum Industries, Inc.

THE mineral gypsum when ideally pure has the chemical formula $CaSO_4 2H_2O$, but as known in commerce gypsum is never ideally pure, the composition varying more or less in different and even in the same deposits.

In the gypsum industry, it is usually defined as a material containing not less than 64.5% $CaSO_4 2H_2O$. Gypsum plasters may vary more than raw gypsum, depending usually upon the process of manufacture. The definitions of gypsum and gypsum plasters issued by the American Society for Testing Materials are given below:

Gypsum[1]

"(a) Pure gypsum is calcium sulphate combined in crystalline form with two molecules of water.

"(b) Its chemical formula is $CaSO_4 2H_2O$.

"(c) No material may be considered gypsum within the meaning of these specifications which contains less than 64.5% by weight of $CaSO_4 2H_2O$."

Gypsum Neat Plaster[2]

"Gypsum neat plaster is a plastering material in which not less than 85% of the cementitious material is calcined gypsum mixed at the mill with other materials.

"Gypsum neat plaster shall contain not less than 85% by weight of calcined gypsum. The remainder may consist of materials to control the working quality, setting time and the fibering."

From the previous definition of gypsum stating that no material may be considered as gypsum which contains less than 64.5% by weight of $CaSO_4 2H_2O$, and the above definition, the minimum percentage of $CaSO_4 \frac{1}{2}H_2O$ in gypsum neat plaster may be calculated.

Gypsum containing the minimum $CaSO_4 2H_2O$ content (64.5%) when calcined contains 60.5% $CaSO_4 \frac{1}{2}H_2O$. Therefore, no material containing less than 60.5% $CaSO_4 \frac{1}{2}H_2O$ may be considered as calcined gypsum. Again from the definition of gypsum neat plaster the minimum amount of $CaSO_4 \frac{1}{2}H_2O$ allowed in gypsum neat plaster is 51.4% $CaSO_4 \frac{1}{2}H_2O$.

Gypsum neat plaster is prepared to be used with sand for the scratch and brown coats of wall plaster. Recommended practice calls for the use of one part of gypsum neat plaster to two parts of sand by weight for the scratch coat and one part of gypsum neat plaster to three parts of sand by weight for the brown coat.

With a gypsum neat plaster containing the minimum $CaSO_4 \frac{1}{2}H_2O$ content (51.4%), in a 1:2 sanded mix the percentage of $CaSO_4 \frac{1}{2}H_2O$ by weight is 17.15% and in a 1:3 sanded mix is 12.8%. In reality the percentage of cementitious material instead of being 1:2 and 1:3 by weight is 1:4⅘ and 1:6⅘.

One of the advantages claimed for a weight basis in proportioning plaster and sand is that in case of failure, over-sanding of the plaster may be easily detected. Analysis of the foregoing definitions shows that several difficulties enter into this determination. If a sample of the neat plaster used is available for analysis it could not be said that a plaster is over-sanded unless in the scratch coat less than 17.13% of $CaSO_4 \frac{1}{2}H_2O$ is present and in the brown coat less than 12.84%. A plaster showing percentages of $CaSO_4 \frac{1}{2}H_2O$ above those stated might be over-sanded but proof of this is difficult if the failure occurs some time after erection of the plastering because of inability to determine the composition of the neat plaster.

Gypsum Ready-Sanded Plaster[2]

"Gypsum ready-sanded plaster is a plastering material in which the predominating cementitious material is calcined gypsum, and which is mixed at the mill with all the constituent parts, including sand, and in their proper proportion. It requires only the addition of water to make it ready for use.

"The following shall govern the composition of gypsum ready-sanded plaster for the desired coats:

"(a) Scratch or first coat. Gypsum ready-sanded plaster used for scratch or first coat shall contain not more than two-thirds by weight of sand. The remainder shall contain not less than 75% of its weight of calcined gypsum. The other 25% of this remainder may consist of materials to control the working quality, setting time, and the fibering.

"(b) Browning or second coat. Gypsum ready-sanded plaster used for browning or second coat shall contain not more than 75% by weight of sand. The remainder shall contain not less than 75% by weight of calcined gypsum. The other 25% of this remainder may consist of materials to control the working quality, setting time, and the fibering."

From the description of gypsum-ready-sanded plaster it appears that the minimum $CaSO_4 \frac{1}{2}H_2O$ content for the two sanded coats is still lower than that of plaster mixed on the job. For a scratch coat the minimum $CaSO_4 \frac{1}{2}H_2O$ is 15.13% and for a brown coat it is 11.35%. Therefore the percentage of cementitious material to inert material is really 1:5⅗ for the scratch coat and 1:7⅘ for the brown coat instead of 1:2 and 1:3 respectively.

Gypsum Wood-Fibered Plaster[3]

"Gypsum wood fibered plaster is a gypsum plaster in which wood fiber is used as an aggregate.

"Gypsum wood-fibered plaster shall contain not less than 80% by weight of calcined gypsum, and not less than 1% by weight of wood fiber made from a non-staining wood. The remainder may consist of materials to control the working quality and setting time."

As gypsum wood-fibered plaster is used neat for plastering the minimum $CaSO_4 \frac{1}{2}H_2O$ content allowed is 48.4%.

A survey of the foregoing specifications show that of two wood-fibered plasters or two sanded plasters one may contain twice as much $CaSO_4 \frac{1}{2}H_2O$ as the other and still be within the A. S. T. M. specifications for the respective plasters. The effect of this great variation in composition on the strength and other properties of the materials is therefore of practical interest.

Gypsum is mined in two common forms: as rock gypsum and as gypsite. Gypsum mined in rock formation is generally purer than gypsite, the impurities in it being usually anhydrite, calcium carbonate, flint, or dolomite. Gypsite is an earthy formation of gypsum, usually containing clay as well as the above impurities found in rock gypsum. After calcination it is often the practice to add clay or hydrated lime to the calcined material in order to improve

[1]Tentative Specifications for Gypsum, Proceedings of the American Society for Testing Materials, 22, 1922. Serial Designation C22-22T.

[2]Standard Specifications for Gypsum Plasters, American Society for Testing Materials Standards, 1921, Serial Designation C28-21.

*Published by Permission of the Director of the Bureau of Standards of the U. S. Department of Commerce.

[2]Standard Specifications for Gypsum Plasters, American Society for Testing Materials, 1921, Serial Designation C28-21.

[3]Standard Specifications for Gypsum Plasters, American Society for Testing Materials Standards, 1921, Serial Designation C28-21.

TABLE I.—EFFECT OF COMPOSITION ON THE PROPERTIES OF ROCK GYPSUM PLASTERS

Composition	Pct. $CaSO_4$, ½ H_2O in dry mix	Cc. of H_2O per 100 gm. of plaster	Age, 1 week, tensile strength, lbs. per sq. in.		Age, 1 week, tensile strength, lbs. per sq. in., hair fibred		Age, 1 week, tensile strength, lbs. per sq. in., wood fibred		Time of set
			Unretarded	Retarded	Unretarded	Retarded	Unretarded	Retarded	Retarded
Calcined gypsum	86.7	52.6	402	263	415	256	316	267	9 hr. 20 min.
90% calcined gypsum 10% calcium carbonate	78	47.8	386	346	428	306	355	317	.....
80% calcined gypsum 20% calcium carbonate	69.4	45.6	368	325	351	205	344	350	.....
70% calcined gypsum 30% calcium carbonate	60.6	41.8	363	219	376	214	316	348	.....
60% calcined gypsum 40% calcium carbonate	52	38.5	372	239	350	198	346	287	8 hr. 15 min.
90% calcined gypsum 10% ball clay	78	51.8	365	234	385	220	270	236	.....
80% calcined gypsum 20% ball clay	69.4	51.5	358	220	288	226	256	225	.....
70% calcined gypsum 30% ball clay	60.6	51.2	237	179	255	174	225	162	.....
60% calcined gypsum 40% ball clay	52	51	178	122	197	159	166	147	3 hr. 20 min.
85% calcined gypsum 15% hydrated lime	73.7	57.6	211	189	188	.....	208	.....	3 hr. 15 min.
85% (90% calcined gypsum 10% calcium carbonate) + 15% hydrated lime	66.7	53	224	156	.....	.....	.....	.....	.....
85% (70% calcined gypsum 20% calcium carbonate) + 15% hydrated lime	51.4	46	208	167	.....	.....	.....	.....	1 hr. 20 min.
85% (90% calcined gypsum 10% clay) + 15% hydrated lime	66.7	56.6	178	135	.....	.....	.....	.....	.....
85% (70% calcined gypsum 20% clay) + 15% hydrated lime	51.4	57	136	94	.....	.....	.....	.....	1 hr. 15 min.
85% (90% calcined gypsum 10% calcium carbonate) + 15% clay	66.7	46.4	303	281	.....	.....	.....	.....	.....
85% (70% calcined gypsum 30% calcium carbonate) + 15% clay	51.4	40	321	265	.....	.....	.....	.....	4 hr. 50 min.
Calcined gypsum 1:2 sand	28.9	24.2	250	228	261	214	.....	.....	4 hr. 50 min.
Calcined gypsum 1:3 sand	21.7	23.3	186	149	205	139	.....	.....	4 hr. 10 min.
(90% calcined gypsum 10% calcium carbonate) 1:2 sand	26	23.5	244	183	.....	.....	.....	.....	.....
(90% calcined gypsum 10% calcium carbonate) 1:3 sand	19.5	21.7	219	114	.....	.....	.....	.....	.....
(60% calcined gypsum 40% calcium carbonate) 1:2 sand	17.33	21.3	176	127	.....	.....	.....	.....	4 hr. 15 min.
(60% calcined gypsum 40% calcium carbonate) 1:2 sand	13	21.3	106	75	.....	.....	.....	.....	2 hr. 55 min.
(90% calcined gypsum 10% clay) 1:2 sand	26	23.7	241	190	.....	.....	.....	.....	.....
(90% calcined gypsum 10% clay) 1:3 sand	19.5	22	196	113	.....	.....	.....	.....	.....
(60% calcined gypsum 40% clay) 1:2 sand	17.33	22.7	147	113	.....	.....	.....	.....	1 hr. 20 min.
(60% calcined gypsum 40% clay) 1:3 sand	13	22	101	89	.....	.....	.....	.....	47 min.
(85% calcined gypsum 15% hydrated lime) 1:2 sand	24.6	25.2	198	149	209	.....	.....	.....	1 hr. 6 min.
(85% calcined gypsum 15% hydrated lime) 1:3 sand	18.4	23.7	134	120	144	.....	.....	.....	1 hr. 3 min.
[85% (90% calcined gypsum 10% calcium carbonate) + 15% hydrated lime] 1:2 sand	22.1	24.2	176	134	176	148	.....	.....	1 hr. 35 min.
[85% (90% calcined gypsum 10% calcium carbonate) + 15% hydrated lime] 1:3 sand	16.7	22.8	108	92	132	105	.....	.....	1 hr. 20 min.
[85% (69.7% calcined gypsum 30.3% calcium carbonate) + 15% hydrated lime] 1:2 sand	17.15	22.5	122	98	142	113	.....	.....	57 min.
[85% (69.7% calcined gypsum 30.3% calcium carbonate) + 15% hydrated lime] 1:3 sand	12.83	20.8	88	67	98	76	.....	.....	51 min.
[85% (90% calcined gypsum 10% calcium carbonate) + 15% clay] 1:2 sand	22.1	23.5	205	146	238	141	.....	.....	.....
[85% (90% calcined gypsum 10% calcium carbonate) + 15% clay] 1:3 sand	16.7	21	162	110	156	100	.....	.....	.....
[85% (69.7% calcined gypsum 30.3% calcium carbonate) + 15% clay] 1:2 sand	17.15	20.9	169	120	195	151	.....	.....	.....
[85% (69.7% calcined gypsum 30.3% calcium carbonate) + 15% clay] 1:3 sand	12.83	20	161	82	135	93	.....	.....	.....
[85% (90% calcined gypsum 10% clay) + 15% hydrated lime] 1:2 sand	22.1	26.8	113	114	156	103	.....	.....	.....
[85% (90% calcined gypsum 10% clay) + 15% hydrated lime] 1:3 sand	16.7	24.7	105	63	131	99	.....	.....	.....
[85% (69.7% calcined gypsum 30.3% clay) + 15% hydrated lime] 1:2 sand	17.15	26.7	53	56	91	103	.....	.....	.....
[85% (69.7% calcined gypsum 30.3% clay) + 15% hydrated lime] 1:3 sand	12.83	23.7	61	50	93	88	.....	.....	.....
80% calcined gypsum + 20% hydrated lime	69.4	61.8	.....	.....	.....	.....	169	.....	.....
80% (70% calcined gypsum + 30% limestone) + 28% hydrated lime	48.8	52.8	.....	.....	.....	.....	162	.....	.....
80% (70% calcined gypsum + 30% clay) + 20% hydrated lime	48.8	61.2	.....	.....	.....	.....	109	.....	.....
80% (70% calcined gypsum + 30% limestone) + 20% clay	48.8	42	.....	.....	.....	.....	230	.....	.....

TABLE II.—EFFECT OF COMPOSITION ON THE PROPERTIES OF GYPSITE-PLASTER

Composition	Pct. $CaSO_4$, ½ H_2O in dry mix	Cc. of H_2O per 100 gm. of plaster	Age, 1 week, tensile strength, lbs. per sq. in.	Age, 1 week tensile strength, lbs. per sq. in., hair fibred	Age, 1 week, tensile strength, lbs. per sq. in., wood fibred	Weight of cu. ft. of set material in lbs.	Weight of cu. ft. of dry material in lbs.
Calcined gypsite	74.6	48.6	226	.....	206	80	59
90% calcined gypsite 10% calcium carbonate	67.1	45.4	226	.....	240	84	60
70% calcined gypsite 30% calcium carbonate	57.7	39	242	.....	241	88	62
90% calcined gypsite 10% ball clay	67.1	48	198	.....	185	79	58
70% calcined gypsite 30% ball clay	52.2	48	118	.....	134	78	59
85% calcined gypsite 15% hydrated lime	63.4	59	116	.....	.....	70	55
85% (90% calcined gypsite 10% calcium carbonate) + 15% hydrated lime	55.7	57	120	.....	.....	71	56
85% (80% calcined gypsite 20% calcium carbonate) + 15% hydrated lime	50.8	54	113	.....	.....	72	58
85% (90% calcined gypsite 10% clay) + 15% hydrated lime	57	60	115	.....	.....	69	56
85% (80% calcined gypsite 20% clay) + 15% hydrated lime	50.8	61	96	.....	.....	67	55
85% (90% calcined gypsite 10% calcium carbonate) + 15% clay	57	46	170	.....	.....	83	60
85% (80% calcined gypsite 20% calcium carbonate) + 15% clay	50.8	42	192	.....	.....	87	62
Calcined gypsite 1:2 sand	24.9	22.7	185	173	.....	106	91
Calcined gypsite 1:3 sand	18.65	21	132	138	.....	106	94
(90% calcined gypsite 10% calcium carbonate) 1:2 sand	22.4	22	147	164	.....	106	94
(90% calcined gypsite 10% calcium carbonate) 1:3 sand	16.8	20.5	107	122	.....	107	94
(80% calcined gypsite 20% calcium carbonate) 1:2 sand	19.9	20.8	142	.....	.....	.....	.....
(70% calcined gypsite 30% calcium carbonate) 1:2 sand	17.4	20.2	134	127	.....	107	94
(70% calcined gypsite 30% calcium carbonate) 1:3 sand	13	19.5	83	82	.....	106	98
(90% calcined gypsite 10% clay) 1:2 sand	22.4	23	128	142	.....	105	.....
(90% calcined gypsite 10% clay) 1:3 sand	16.8	20.7	117	111	.....	106	.....
(70% calcined gypsite 30% clay) 1:2 sand	17.4	22	123	112	.....	106	89
(70% calcined gypsite 30% clay) 1:3 sand	13	20.4	94	95	.....	107	95
(85% calcined gypsite 15% hydrated lime) 1:2 sand	21.1	25	128	110	.....	100	87
(85% calcined gypsite 15% hydrated lime) 1:3 sand	15.85	23	94	91	.....	102	92
[85% (90% calcined gypsite 10% calcium carbonate) + 15% hydrated lime] 1:2 sand	19	24.2	112	104	.....	101	88
[85% (90% calcined gypsite 10% calcium carbonate) + 15% hydrated lime] 1:3 sand	14.25	22.5	77	70	.....	106	93
[85% (80% calcined gypsite 20% calcium carbonate) + 15% hydrated lime] 1:2 sand	16.9	23.8	98	87	.....	102	90
[85% (80% calcined gypsite 20% calcium carbonate) + 15% hydrated lime] 1:3 sand	12.7	22.5	61	65	.....	103	94
[85% (90% calcined gypsite 10% calcium carbonate) + 15% clay] 1:2 sand	19	22.5	116	128	.....	103	.....
[85% (90% calcined gypsite 10% calcium carbonate) + 15% clay] 1:3 sand	14.75	21.2	88	89	.....	104	.....
[85% (80% calcined gypsite 20% calcium carbonate) + 15% clay] 1:2 sand	16.9	21.7	101	120	.....	104	92
[85% (80% calcined gypsite 20% calcium carbonate) + 15% clay] 1:3 sand	12.7	20	77	92	.....	106	97
[85% (90% calcined gypsite 10% clay) + 15% hydrated lime] 1:2 sand	19	25	107	113	.....	101	.....
[85% (90% calcined gypsite 10% clay) + 15% hydrated lime] 1:3 sand	14.25	22.5	84	83	.....	103	.....
[85% (80% calcined gypsite 20% clay) + 15% hydrated lime] 1:2 sand	16.9	25	89	94	.....	101	86
[85% (80% calcined gypsite 20% clay) + 15% hydrated lime] 1:3 sand	12.7	22.5	73	70	.....	102	91
80% calcined gypsite + 20% hydrated lime	59.7	63	.....	.....	102	66	.....
80% (90% calcined gypsite + 10% $CaCO_3$) + 20% hydrated lime	53.7	57	.....	.....	93	.....	.....
80% (80% calcined gypsite + 20% $CaCO_3$) + 20% hydrated lime	47.75	55	.....	.....	106	69	.....
80% (90% calcined gypsite + 10% clay) + 20% hydrated lime	53.7	63.2	.....	.....	.....	96	.....
80% (80% calcined gypsite + 20% clay) + 20% hydrated lime	47.75	61	.....	.....	.....	93	64*
80% (90% calcined gypsite + 20% calcium carbonate) + 20% clay	53.75	46	.....	.....	.....	158	.....
80% (80% calcined gypsite + 20% calcium carbonate) + 20% clay	47.75	43.2	.....	.....	.....	164	80*

*Wood fibred.

its working quality. Hair is usually added to sanded plasters for scratch coat work in order to obtain a better key, and retarder is added to control the time of set.

The following work was carried out in order to determine the effect of the composition of plaster (within A. S. T. M. limits) on its strength and other properties. A sample of calcined gypsum made from gypsum rock and one of calcined gypsum made from gypsite were obtained and analyzed for $CaSO_4 \frac{1}{2}H_2O$ content. These samples were mixed with varying proportions of ground calcium carbonate, clay, hydrated lime, hair fiber, wood fiber and retarder. First, the different mixtures were mixed with water to the same consistency and molded in the form of briquettes. (The consistency was determined by the slump method, a ½-in. slump of a 2x4-in. cylinder being used throughout). After seven days the briquettes were broken. The results obtained are shown in Tables I and II.

The strengths required of gypsum plasters according to the specifications of the American Society for Testing Materials are as follows:

	Lb. per sq. in.
Gypsum neat plaster	150
Gypsum sanded plaster 1:2	75
Gypsum sanded plaster 1:3	50
Gypsum wood-fibred plaster	125

A few of the mixtures tested did not meet the above requirements but this was only where the $CaSO_4 \frac{1}{2}H_2O$ content approached a minimum and the water content approached a maximum.

The Effect of Fineness on Consistency

The properties of a set gypsum plaster are dependent, to a great extent, upon the amount of water required by the plaster to reach a desired consistency. Water content is again dependent largely upon the fineness of the plaster, and the fineness of the materials added to it.

In general, the finer neat-gypsum plasters are, the greater the amount of mixing water required.[4] In this work the addition of coarse materials lowered the percentage of mixing water necessary in almost every instance. The addition of fine materials increased the amount of mixing water required. Ball clay, however, lowered slightly the amount of mixing water required even though finer and lighter than the calcined gypsum. It has been noted at the Bureau of Standards that plastic hydrated limes require less mixing water than non-plastic hydrates even though relatively of the same fineness. This result might be due to the extreme plasticity of the clay used.

The Effect of Composition on the Amount of Mixing Water Required

The effect of composition on the amount of mixing water required follows the above in general. That is, coarse materials added to the plaster decrease the amount of mixing water required and fine materials increase it. Limestone, a coarse material, decreased the percentage of mixing water necessary in all neat mixtures. In the sanded mixtures, coarse material decreased the amount of mixing water up to a point where the mixture was lean (that is where very little fine material was present), but upon further reduction of the fine material the required amount of mixing water increased. Clay decreased slightly the amount of mixing water necessary in both neat and sanded mixtures. Hydrated lime increased the amount of mixing water required in all mixtures.

The Effect of Mixing Water on the Strength

The amount of mixing water used affects the strength of the set plaster considerably. It will be noted that in almost every instance where the percentage of $CaSO_4 \frac{1}{2}H_2O$ in different dry mixture was the same the strongest material was the one requiring the smallest amount of mixing water and the weakest material was the one requiring the largest amount.

The Effect of Composition on the Strength

The strength of set plaster is dependent upon the amount of water used and the amount of $CaSO_4 \frac{1}{2}H_2O$ in the mixture.

Repeated additions of limestone decreased slightly the strength of gypsum neat plaster made from gypsum rock but appeared to increase the strength of gypsum plaster made from gypsite. Repeated additions of limestone decreased the strength of all gypsum sanded plasters.

Additions of clay up to 20% decreased slightly the strength of all gypsum neat plasters. Additions of clay above 20% decreased considerably the strength of all gypsum neat plasters. Additions of clay decreased the strength of all gypsum sanded plasters. These results agree with those obtained by Porter.[5]

Additions of 15% or 20% of hydrated lime decreased appreciably the strength of all gypsum neat plasters. Additions of hydrated lime decreased the strength of all gypsum sanded plasters.

Hair fiber appeared to have little effect on the strength of gypsum neat or sanded mixtures. Wood fiber seemed to decrease somewhat the strength of neat plasters.

Retarder weakened both gypsum neat plasters and gypsum sanded plasters. The retarder was added in the ratio of 0.5% by weight of the calcined gypsum.

The Effect of Fineness on the Density of the Set Material and Dry Material

It is a recognized fact in the cement industry that grading the size of the aggregate in concrete will increase the density of the hardened material. That is, a certain amount of fine material and a certain amount of coarse material are necessary to give the densest product. Where too much coarse material is used segregation takes place and where too much fine material is used the concrete is too porous. The same appears to be true of plaster. The density of the hardened material increases with increase in coarse material up to a certain point, where it decreases. The weight of a unit volume of dry material, however, seems to increase with increase in coarse material. It is logical to suppose that there is a point where the reverse takes place but this point was not reached.

The Effect of Composition on the Density of the Set Material

The effect of the nature of the materials added to the calcined gypsum upon the density runs parallel with that of their fineness. Limestone increased the density of the set plaster in both neat and sanded mixtures by lowering the water content and because of its own greater weight. Clay, while lowering the water content slightly, nevertheless decreased the density, as the clay itself was lighter than the displaced $CaSO_4 \frac{1}{2}H_2O$. Wood fiber decreased the density of the neat mixtures.

The Effect of Composition on the Density of the Dry Material

The coarse heavy limestone increased the density of all the dry neat plasters and dry sanded plasters. The fine lighter materials such as clay and hydrated lime, decreased the density of both dry neat plasters and dry sanded plasters. The dry neat plasters in this instance varied in weight as much as 7 lb. per cu. ft. Tests by Emley and Faxon of many different plasters showed much larger variations.[6] The results obtained in this work show that gypsum neat plaster and sand having a ratio of 1:1 by weight have approximately a ratio of 1.6:1 by volume. Therefore gypsum plaster and sand should not be mixed in the same ratio by volume as they are by weight.

The Effect of Composition on the Time of Set of Retarded Gypsum Plaster

All the materials added to both the retarded neat and the retarded sanded plasters decreased the setting time of the plasters. Lime appeared to decrease the time of set most, clay next, and sand the least. It is noticeable that the time of set is decreased with increase in fine material. Commercial retarder was used to retard the set of all the plasters. Keane[7] states that materials of that nature retard the set of calcined gypsum by acting as protective colloids. If such is the case decrease in setting time with increase in fineness might be explained by the decreased protective action of the colloid because of the greater surface area of the fine material.

The requirements of a plastering material

[4] Johnson, H. V. Plastering Sands. Not yet published.

[5] Porter, J. M. Effect of Tennessee Ball Clay upon Tensile Strength of Gypsum, Rock Products, February 23, 1924.

[6] Emley and Faxon, Results of Testing Gypsum Products, Journal of American Ceramic Society 3 12 (1923).

[7] Keane, L. A. Plaster of Paris, Jour. Phys. Chem. 20, 721 (1916).

are determined by its use. In some places a strong plaster is desired and in those instances a plaster having a high $CaSO_4$ $\frac{1}{2}H_2O$ content and great density would be the best. It is the present belief that set plasters having a high $CaSO_4$ $2H_2O$ content and high porosity are the best for fire resistive properties and that for low sound transmission dense plasters are the best. Plasters having low density, however, give the best results for covering surface per unit of weight.

Hydrated lime and clay are added to calcined gypsum to increase its working quality. These materials decrease the strength of gypsum plasters. Pearson and Hitchcock[8] state that the effect of any mixture on the workability of concrete is dependent mainly on the fineness as measured by the completeness of its distribution in the mixture. The same should be true of gypsum plaster. Finer grinding of the calcined gypsum has been found to give the desired workability without the addition of clay or hydrated lime and at the same time there would be no reduction of the cementitious material.

Conclusions

1. Gypsum plasters may vary considerably in composition and be classified as similar materials.

2. Proportioning neat gypsum plaster and sand by volume may give still greater variations.

3. In general the higher the $CaSO_4$ $\frac{1}{2}H_2O$ content in gypsum plaster the stronger the set plaster is.

4. The greater the amount of mixing water required for gypsum mortar the weaker the set plaster is.

5. Coarse materials in gypsum plaster such as limestone and sand lower the amount of mixing water required except in lean mixtures.

6. Coarse materials in gypsum plaster such as limestone and sand increase the weight of set plaster and dry plaster per unit volume.

7. Fine materials in gypsum plaster such as hydrated lime raise the amount of mixing water required.

8. Fine materials in gypsum plaster such as clay and hydrated lime decrease the density of dry plaster per unit volume but cover a greater surface per unit weight of plastering.

9. Fine materials in gypsum plasters make necessary the addition of larger amounts of retarder to obtain the desired increase in setting time.

Lime Company Builds an Ice Plant

THE Superior Lime and Hydrate Co., Pelham, Ala., is completing arrangements for the construction of an ice-manufacturing plant and will place orders for primary equipment at once. It has work under way on extensions in its lime plant, to include the installation of two additional kilns and auxiliary machinery. H. G. Bridgewater is general manager.

[8]Pearson and Hitchcock. A Penetration Test for the Workability of Concrete Mixtures with Particular Reference to the Effect of Certain Powdered admixtures. Proc. of the A. S. T. M. Part II, 23, 726 (1923).

Lime in Small Packages

THE objection of many lime manufacturers to going into a "less-than-carload" business is overcome by selling lime to a live-wire distributor who will make this

business a specialty. The cut shows how 10-lb. bags of lime hydrate are put up by the Lee Lime Co., Lee, Mass., for such a distributor, the Pulver Distributing Co., Pittsfield, Mass. This company also sells and distributes hydrated lime in 2-lb. pasteboard cartons—profitably, too.

Why Highway Contractors Fail

WRITING to *The Constructor,* Chas. M. Upham, former state highway engineer of North Carolina, and at present director of the Board of Highway Research, says:

We have had some 10 or 15 failures in North Carolina and when summarized it is found 80% of the cause is due either to insufficient finance, or incompetency of the contractor to plan and carry on his work. Probably the last is the greatest factor in contractors defaulting.

We have reports and letters from contractors that due to various reasons they are being asked, by the engineers, to do things that are not called for in specifications. It is seldom, if ever, these things have foundation. It is generally found they have either planned their work extravagantly, or are operating in that way. I am not referring to contractors who successfully plan and operate their work—but I am speaking simply of those that have defaulted and are having trouble in completing their construction contracts.

We recently received a letter written by a contractor who did not want to bid in North Carolina because "one had to do everything that was in specifications." He went on at length describing in detail, but the gist of his remarks is covered in that statement.

Therefore, it seems to me that it would overcome a tremendous waste, which now exists, if all contractors would employ men who are thoroughly capable of bidding and of operating their jobs.

I will guarantee to take 80 to 90% of the defaulted contractors in North Carolina, and possibly in most any state, and upon analysis show that the basic reason for their default reverted back either to incompetency, extravagance of operation or lack of finance.

Many Canadian Gypsum Deposits As Yet Inaccessible

CANADA, before the war, was the largest producer of gypsum in the world. Its biggest and most easily accessible deposits are in Nova Scotia and New Brunswick. British Columbia's deposits also are extensive and of high-grade gypsum, but, owing to lack of transportation facilities, they can not yet be worked profitably, as is also the case in remote regions of Manitoba, Ontario, and British Columbia. The Canadian production in 1923 totaled 559,778 short tons, valued at $2,165,953, as compared with 559,265 tons, worth $2,160,898, in the year previous. The output of gypsum rock amounted to 565,120 tons, of which 150,481 tons, or 27 per cent, were calcined during the year.

The exports of gypsum from Canada during the year ended March 31, 1924, amounted to 401,983 tons, consisting of 397,329 tons of crude and 4,654 tons of ground gypsum, with a total value of $671,337, as compared with 343,098 tons valued at $523,296 in 1922-23. The United States took the entire amount of gypsum from Canada during the years 1922, 1923 and 1924.—*U. S. Commerce Reports.*

Large Deposits of Gypsum in Nova Scotia

EXPERTS employed by the Canadian Pacific railway to examine resources along its lines in Nova Scotia report an undeveloped deposit of exceptionally high-grade gypsum, most favorably located for development and shipment, on Shubenacadie river, having a measurable tonnage of 200,000 tons, and probably several further million tons of commercial gypsum. The quantity of gypsum quarried in Nova Scotia last year was more than 300,000 tons, compared with 256,000 tons in the previous year. Considerable quantities of gypsum have been sold lately to the countries of South America, Cuba, Japan, Australia and the United States.

Dredging Sand and Gravel Near Pittsburgh

Keystone Sand and Supply Company a Pioneer in Methods Now Generally Adopted in the District

THE Keystone Sand and Supply Co. of Pittsburgh, Penn., is one of the group of related incorporations that are known as the Dravo companies. There are several of these companies and their activities include marine construction, fabricating structural steel, placing foundations and other sorts of mechanical and engineering work.

This relation gives the Keystone Sand and Supply Co. a unique position among sand and gravel producers. The same group of companies not only produces sand and gravel but makes all the machinery necessary for its production, dredges, barges, gantry and locomotive cranes, bins, hoppers and whatever else is needed. It has retail yards in Pittsburgh and nearby towns from which a man may buy a ton of sand for a new "front steps" of his own making or 20,000 tons for a big reinforced concrete structure—and get the same service. This company long ago discerned that there was a big market for concrete aggregate outside of the regular builders and contractors and without neglecting the large consumers has so cultivated this market that the sales from some of its yards have increased five-fold.

While the company has had several years of life, it is still about the youngest of the large producers in the Pittsburgh district. And it is also a pioneer in several things that have since been adopted by other dredging companies. As an example it built the first large dredge which was not self propelling, thereby saving the cost of a lot of expensive machinery, which was only used once in a while, and, what is of more importance, the cost of employing highly paid licensed engineers and pilots such as government regulations demand of a self-propelled dredge on navigable waters. It also introduced the flush deck type of barge, which is slowly displacing the hopper barge, as it drains the gravel while the barge is filling, reducing the required draft and obviating the cost and trouble of pumping out the hopper with steam siphons. It was freely prophesied that these flush deck barges would roll over when loaded, but that prophecy has long since been forgotten.

The company operates two dredges. It is building a new steel hull dredge that it is expected to be the last word in Ohio river dredges, since it will embody all that the company has learned not only from building its own dredges but those of other companies.

(In parenthesis one may mention that one of the largest of these was a "gold digger" to work the gravel of a river in Columbia, South America. This dredge has a capacity of 1000 yd. an hour and was made as nearly proof as possible against breakages, since it had to maintain itself three months away from the nearest source of repair parts.)

The largest of the two dredges mentioned is called Keystone No. 4, and since the other is in many respects a duplicate (except that it is smaller) only this dredge will be described.

The hull is 145 ft. long and 40 ft. wide. It is 6 ft. deep, but draws only 4 ft. of water. Both hull and superstructure are of steel and there are no living quarters for the crew.

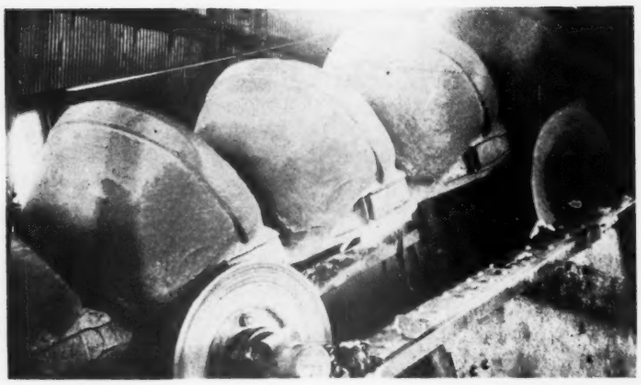
Power is supplied by two vertical boilers. The main engine is a 100-hp. tandem compound with cylinders 11x20x22-in. The steam pressure is 145 lb. and the exhaust steam goes to a jet condenser which has a vacuum pump of the same make.

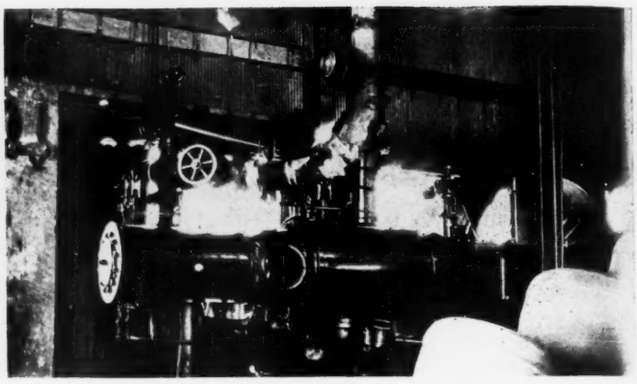
The digging ladder, or bucket line, has 84 5½-cu. ft. buckets, and they are close connected. These buckets and the chain that connects them are of high-carbon steel and not of manganese steel as in so many other dredges. This high carbon steel is found to give a very satisfactory length of service.

Bow view of Keystone Dredge No. 4 with digging ladder down and barges in position for loading

The buckets are of the half-round type, resembling half a bowl. They are cast of high carbon steel in one piece, without removable cutting edges or other attachments. When the edge is gone the body of the bucket is so worn that the whole thing may be discarded.

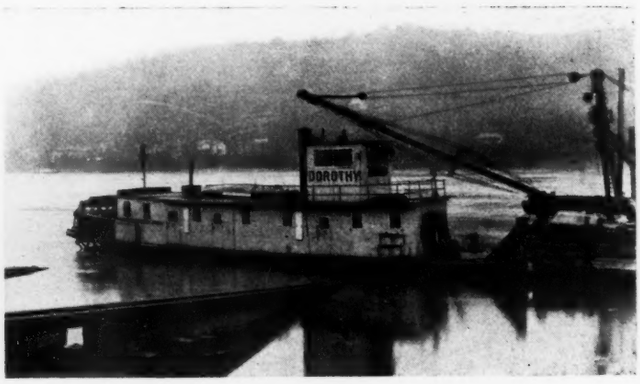
The digging ladder is handled by a Lambert hoist which spools a cable passing through sheaves to give a seven-fold purchase. At the top of the ladder where this frame is pivoted is a pentagonal pulley or tumbler, which does the pulling on the bucket line. The buckets pass over a cylindrical spool at the lower end. The speed is 25 buckets per minute.



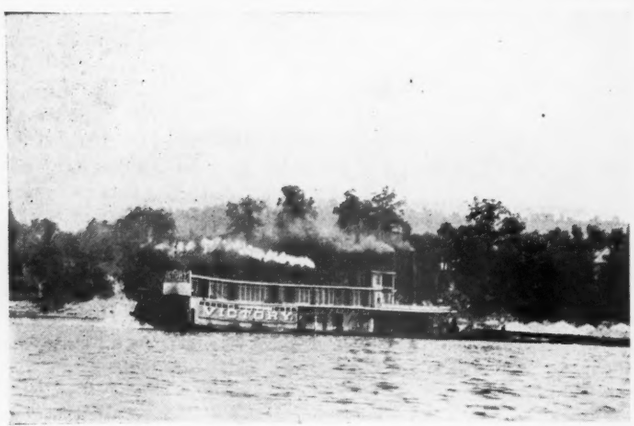


Left—Part of bucket line. Right—The main engine

Left—Empty barge following in loaded barge. Right—Barge being loaded with gravel



Left—Steamboat Peace pushing in barge. Right—Towboat Dorothy powered with oil engines



Left—Steamboat Victory and tow. Right—Pulling out a tow

From the buckets the sand and gravel go over a grizzly and then pass to the screen. This is 18 ft. long and 9 ft. (outside) diameter. It is divided into six sections for convenience in changing the screen and because the sections at one end wear faster than those at the other. There are two jackets, the inner of punched plate having 7/8-in. square holes and the outer jacket of wire cloth having 3/16-in. square meshes. The screen is of the tire and trunnion type and it is friction driven by belt and gearing from the main engine.

Water for washing is added to the material before it goes into the screen by a 10-in. centrifugal pump. This pump has a special ball thrust bearing that has given exceptionally long service. It throws about 1500 g.p.m. ordinarily, but its duty may be increased if desired to 2000 g.p.m.

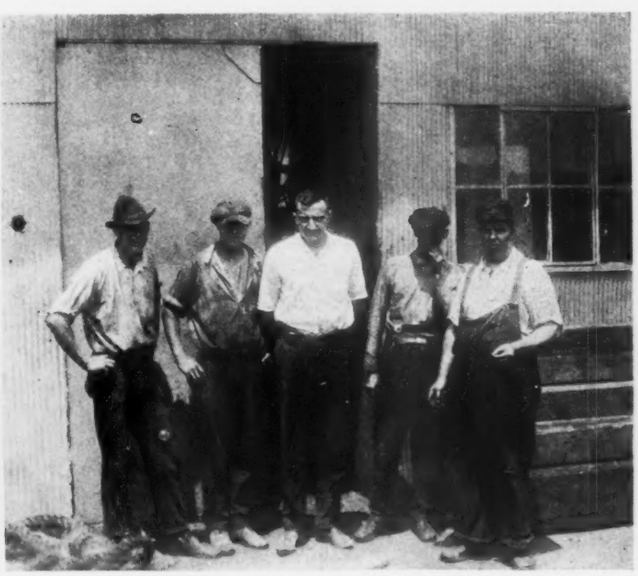
The sand with this water goes to the sump of the sand ladder. The gravel goes to the sump of the gravel ladder, where it is joined by a heavy stream of water thrown in by a 5-in. centrifugal pump which is of Wood's make. All this water overflows at the two sumps and carries away not only clay but any sticks and trash which may have been dredged. The agitation in the sumps caused by the buckets helps in this washing. This is the most efficient means of freeing the sand and gravel from mud and trash that has been discovered in the Pittsburgh field after considerable experimentation.

Both sand and gravel ladders have half round buckets like those on the digging ladder, but of only 2 cu. ft. capacity. Both these bucket lines are driven from the main engine by belt and gearing.

For handling the boat there are four spud engines, one for each spud. These have cylinders 6x6 in. and develop 15 hp. A "nigger" engine operates the capstans on which are wound the lines by which the boat is moved and also the lines used in handling the barges.

The method of handling the dredges is interesting. In a river like the Ohio, where the dredge must often work in shallow water, the important thing is to keep "waste water" or under water space in which waste (oversize and unwanted sand or gravel) may be dropped. If this is not done there is danger that barges or the dredge itself may

Keystone Dredge No. 4 with digging ladder raised. The sand ladder runs to the pent house at about the center of the boat. The gravel ladder, which is similar, is on the other side



Left—Using the steam capstan to move a barge. Right—Crew of dredge. H. Sattlemier, dredgemaster, in center; William Fogg, chief engineer, at right

be grounded on the piles of waste. So a regular system of handling the dredge has to be adopted. The dredge is held in a channel of deep water with its head end (digging end) into the bank from which it is to dig. By pulling on anchor lines and by pivoting on a spud at either the head end or the rear end the dredge is worked along the bank parallel with its edge. In this way all the waste is dropped in a long

Gantry above digging ladder

line in deep water and does not have a chance to accumulate in any one place.

At least 7 ft. of clear water must be kept at all times on both sides of the dredge in order that barges will not ground after they are filled.

All barges are flush deck and most of them are of steel. The standard barge is 135 ft. long and 27 ft. wide and 7 ft. 6 in. deep. When loaded to capacity, which means that no freeboard shows, such a barge will hold 600 tons. But as usually loaded the barges hold around 500 tons.

For handling these barges the company has the steamers Peace and Victory and also the tow boats Dorothy and Virginia, these being driven by 100 hp. 4-cylinder Fairbanks-Morse engines of the semi-Deisel type. These are all stern-wheelers, as are all the other tow boats in this district.

The company maintains landing places and docks for unloading barges not only in Pittsburgh but at Munhall, a few miles out of the city, and at Charleroi, 40 miles away by rail and considerably farther by river. The business at Charleroi is incorporated as the Charleroi Building Supply Co. and handles not only sand and gravel but building materials in general. It also has plants at Freedom, Groveton and McKeesport.

Transportation to all these points is by water. Mr. Dann, the manager of the company, read an excellent paper at the National Sand and Gravel Association's convention at St. Louis on transporting by barges, and it was published in full in the March 8 issue of Rock Products. This paper not only gives a description of the work but it also describes the evolution of the present type of flush deck barge which has been found so satisfactory in service.

Beside the plants at the landings which have been mentioned the company has a plant at Neville's Island, about 20 miles from the city, in which gravel is crushed to sand. The product of this plant has been given the trade name "Supersand," and it is meeting with favor in the Pittsburgh market. This plant will be described in a later issue of Rock Products.

Alex W. Dann is vice-president and treasurer and manager of the Keystone Sand and Supply Co. He is very well known to the sand and gravel producers of the country because of his connection with the National Sand and Gravel Association, of which he was president in 1923. Wm. Maclachlin is in charge of production, and Rowland Jones is manager of the Inland Rivers Wharf Co., which maintains the principal landing place in the city of Pittsburgh. G. P. Dreabler is in charge of the Neville Island plant.

Prospective Algerian Phosphate Developments

Vice Consul D. C. Elkington, Algiers

ALL the phosphate deposits in Algeria are being actively worked, except those of the Djebel-Onk, which are perhaps the most important. They were discovered over 20 years ago, but are still without transportation facilities, owing to the lengthy discussions which the construction of the necessary railroad has brought about. These deposits are conservatively estimated to contain about 1,000,000,000 metric tons. They are 100 km. (62.1 miles) south of Tebessa, Algeria, and 10 km. from the Tunisian border. They are also 300 km. from Bona, the nearest Algerian port, and but 200 km. from the Tunisian port of Oabes.

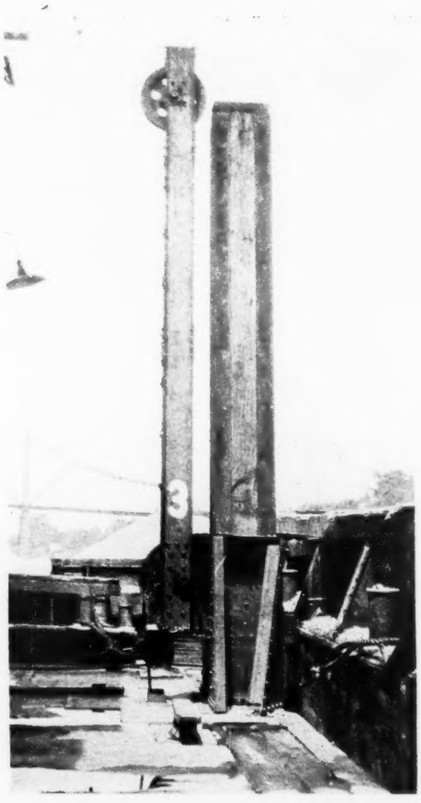
The beds are from 36 to 60 m. thick, about 3 km. wide and 10 km. long, and are free from either silica (quartz) or calcareous clay. Every 300 or 500 m. they are cut by ravines, which will permit their exploitation by "quarry" methods for several centuries.

The purity of the product is sometimes above 80%, although it varies generally from 60 to 69%. It is conceded that 500,000,000 m. tons are about 66% pure. Traces only of iron and aluminum have been found. The absence of silica will render the crushing easy to accomplish, and the freedom from water will obviate the necessity of drying.

From a legal point of view, foreigners can acquire mining properties in France and Algeria under the same terms as French nationals, provided a domicile is maintained in French territory. Practically, however, administrative measures more or less preclude foreign ownership, as accentuated by after-the-war developments, although at present foreign capital is much more welcome.—*U. S. Commerce Reports.*

Lime in Pearl Form

THE Berlin firm of H. Scheidemandel has succeeded in producing lime and gelatin in the form of beads or pearls, says *Industrial and Engineering Chemistry.* These pearls are produced by passing lime or gelatin through fine openings into a fluid or gaseous medium. In falling, the drops form, as a result of the surface tension, as pearl-like, spherical bodies. Through appropriate cooling of this medium, the pearls gelatinize in less than a minute. An ingenious apparatus makes it possible, by absolute prevention of premature decomposition due to heat, for the pearls to possess the same qualities as



Spud hoist on Keystone No. 4 dredge

the liquid lime or gelatin before being made into pearls. In this way a great saving in time and space is accomplished. According to the new process, it will be possible in the future to produce pearls from lime and gelatin in hot countries, which has hitherto been impossible.

Cement from Lime Rock and Coal Ashes

The Security Cement and Lime Co., of Hagerstown, Md., Makes an Excellent Product from an Unusual Material

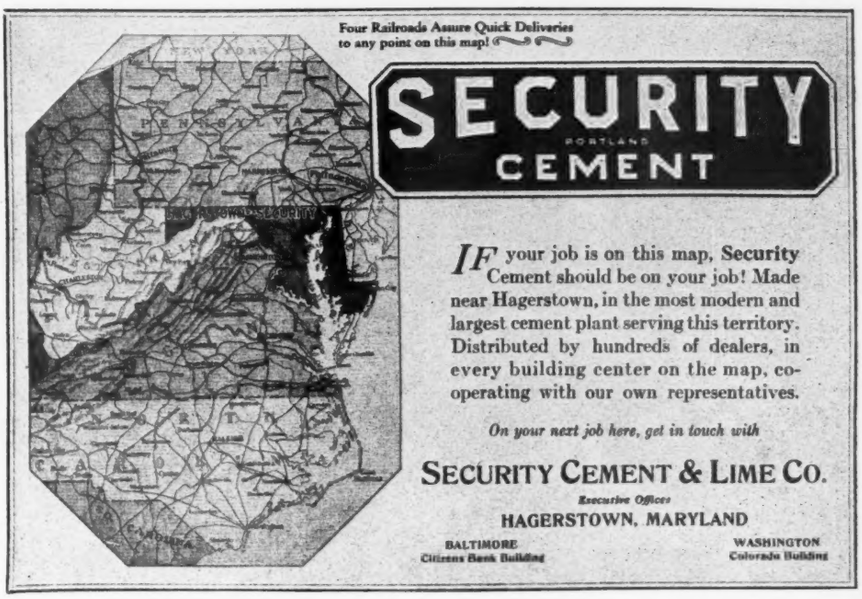
THE portland cement plant of the Security Cement and Lime Co. is at Security, about three miles out of Hagerstown, Md., on the main line of the B. & O. railway. It produces 5000 bbls. daily and its main customers are such particular people as the United States Government, the states of Maryland and Virginia and the Pennsylvania railroad. In spite of the cold-blooded way such customers analyze and treat all the cement that they buy, the plant has not had a rejection or even a complaint in three years. It manufactures portland cement by the dry process.

What makes this record worth noting is the unusual nature of one raw material from which this cement is made. The limestone comes from the company's quarry and for the other ingredient the company uses common coal ashes which it obtains from the Western Maryland railroad and the Potomac Edison Power Co. This is said to be the only company in the United States that uses coal ashes as a source of silica and alumina. But while it is unusual there is no chemical or other technical reason why they should not serve as well as any other substance.

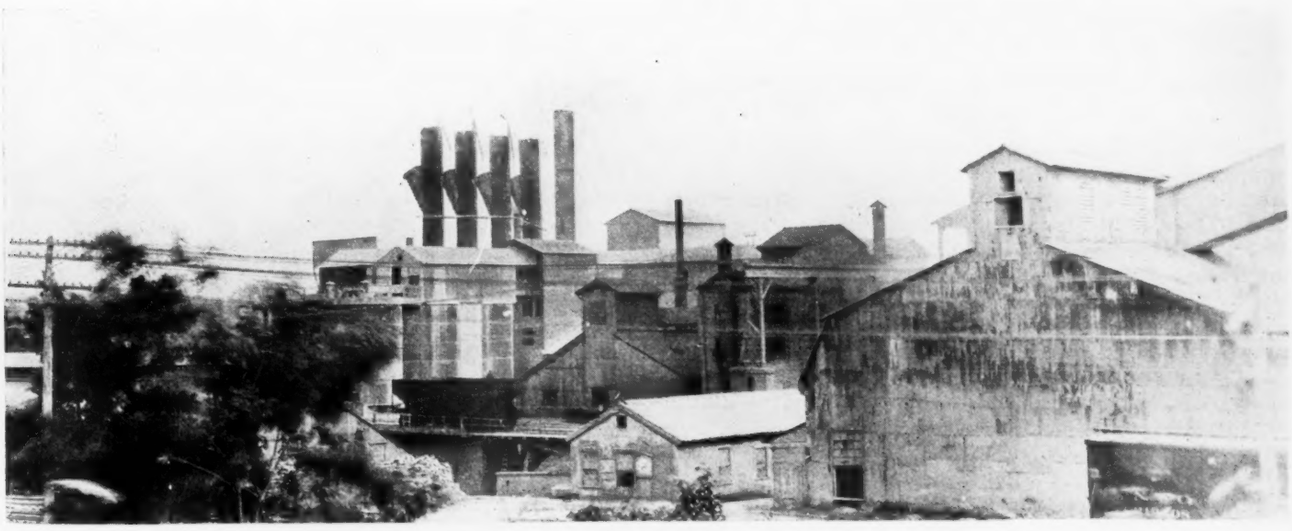
Cement manufacture at this plant begins quite literally at the quarry. The chemist spends a good part of his time there and has two samplers who send in samples from the unbroken face so that the chemist always knows what is ahead of the shovels. One shovel would have almost sufficient capacity to load the 30 "battleship" cars that the plant needs daily but two shovels are employed. This is so that a mix can be made of the different kinds of rock to insure a fair degree of uniformity in the $CaCO_3$ content at the start without shifting shovels.

The actual quarry practice is not unusual. Three well drills are used, two Sanderson Cyclones driven by steam and a Loomis Clipper drill driven by electricity. The face is about 60 ft. high and holes are put down 5 to 7 ft. below the floor. They are spaced 12 ft. apart and set from 20 to 35 ft. back from the face, according to the nature of the rock. Trojan, Grasselli and Hercules powders are used. Gelatin is used in the wet holes which are sometimes encountered.

The three shovels in the quarry are all Marions; one 65-ton steam, one 70-ton steam and one 70-ton electric shovel with crawler tread. This last is worthy of more detailed description since it is one of the newest types of electric shovels, containing its own


Four Railroads Assure Quick Deliveries to any point on this map!
SECURITY
PORTLAND
CEMENT
IF your job is on this map, Security Cement should be on your job! Made near Hagerstown, in the most modern and largest cement plant serving this territory. Distributed by hundreds of dealers, in every building center on the map, co-operating with our own representatives.
On your next job here, get in touch with
SECURITY CEMENT & LIME CO.
Executive Offices
HAGERSTOWN, MARYLAND
BALTIMORE
Citizens Bank Building
WASHINGTON
Colorado Building

How Security cement is advertised



Plant of the Security Cement and Lime Company at Security, Maryland

power plant. It takes alternating current at 2300 volts and by means of a motor-generator set it produces 220 volt direct current. This is used to run the 12 motors which actuate the various parts of the shovel and which are placed so that they are direct-connected, wherever possible. The idea of using direct current motors is that these are particularly adapted to such work, since they exert a powerful torque at all speeds. While there are certain sorts of alternating current motors that do the same thing, the construction is more complicated. With the direct current motor the shovel can pick up the full load quickly from a position of rest and C. E. Taylor, the quarry foreman, says they are still looking for the rock that this shovel cannot lift.

The cars are made by the Koppel Industrial Car and Equipment Co., Koppel, Pa., and are of a different appearance from the ordinary type. They hold 10 tons and are very heavily constructed so that repairs are not often needed. The height is unusual but the shovel men say it is just right for easy loading.

These cars are pulled to the plant incline by a 25-ton Vulcan locomotive. A Lidgerwood hoist pulls the cars to the top of the plant incline and a smaller Lidgerwood dumps them. This small hoist has been fitted with a back gear and pinion and is run by a clutch on the line shaft of the crusher below. The cable on this hoist passes through a block and falls to give the small hoist plenty of purchase to pull the big car over and a counterweight pulls the car body back to position.

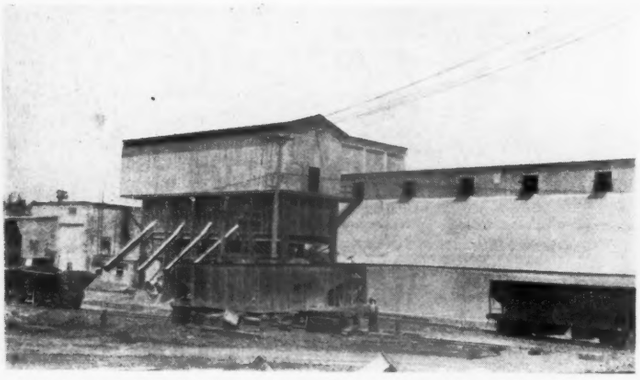
The cars are dumped into the mouth of the primary jaw crusher, which is of Allis-Chalmers make and has a 54x60-in. opening. It is belt driven by a 200-hp. General Electric motor. The crushed rock goes by an inclined belt conveyor to a screen and the oversize of the screen is crushed by a No. 7½ Austin crusher driven by a Westinghouse motor. The product of this crusher is elevated by an 18-in. close-connected bucket and belt elevator, then goes by a conveyor to an Allis-Chalmers screen 25 ft. long and 60-in. diameter. This screen makes commercial crushed stone which the company sells as well as cement. The sizes sold are: screenings, three-quarters, 1½-in. and 2½-in. stone. The oversize of the screen goes to the stone storage where it joins that part of the product not sent to the No. 7½ crusher.

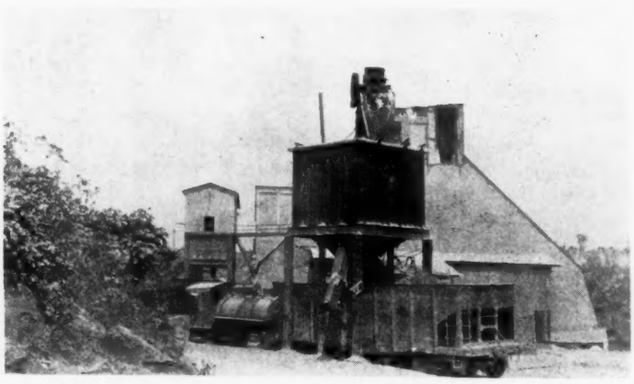
The stone storage house is a very well built concrete structure 230 ft. long and 50 ft. wide. It holds 12,000 tons. The stone is distributed by a central conveyor in the roof which has a tripper that can be run to any part of the belt by its own motor. High-lime stone goes to one end of the bin and low-lime stone (comparatively) to the other.

The stone is reclaimed by two belts in tunnels under the floor. There are 48 gates each with a segmental type feeder to put a definite feed of stone on the belts. These feeders are started and stopped from the tunnel. By means of them the second correction of the mix (the first was at the quarry) is made. If the rock is running high, more gates on the low end are opened and vice versa. The pile is never drawn down low enough to permit an excess of fines to go out on the belt. In this way the storage-house is run not primarily for storage but as a mixing house to insure a uniform grade of stone going to the plant.

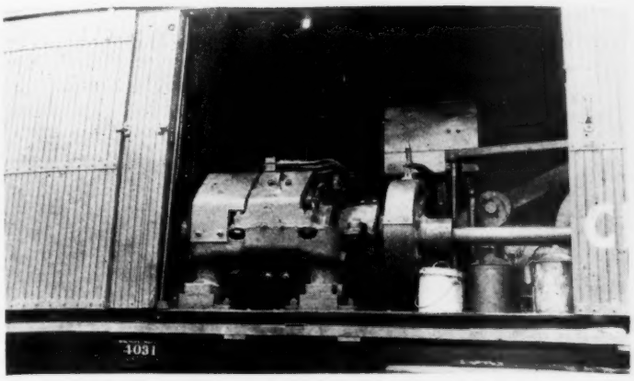
The belts discharge to the boot of an elevator and this elevates the stone to a hopper

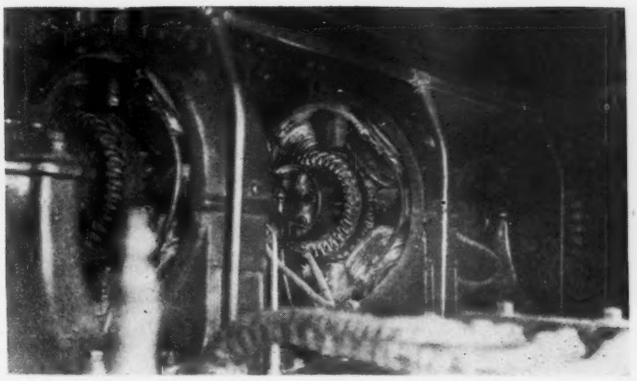
A portion of the quarry face which averages 60 ft. in height





Left—Primary crushing plant, screening plant for crushed stone and part of storage house. Right—End of storage house and small bin that holds just a carload





Left—Looking through the door of the electric shovel. Right—Motor-generator set in shovel which takes alternating current of 2300 volts and generates direct current at 220 volts for use in the various motors

that holds just a carload. This arrangement simplifies loading and gives a check on the stone going to the dryers.

The cars which take the stone to the dryers are 50-ton capacity and standard gage. They are drawn by locomotives to a track hopper from which the stone is elevated to three cylindrical bins with hopper bottom. Belts under these bins feed the stone to the Pennsylvania hammer mill from which it passes to the dryers.

Another set of bins and belts handles the coal ashes in the same way, these being brought in by standard-gage cars on an elevated track which connects with the regular tracks of the plant.

Both stone and ashes are dried, there being two dryers for the stone and one for the ashes. The dryers were made by the Vulcan Iron Works and are 50 ft. long and 5 ft. 6 in. in diameter. They are direct heat rotary dryers and they are provided with angle iron lifters to turn the material as the dryer revolves.

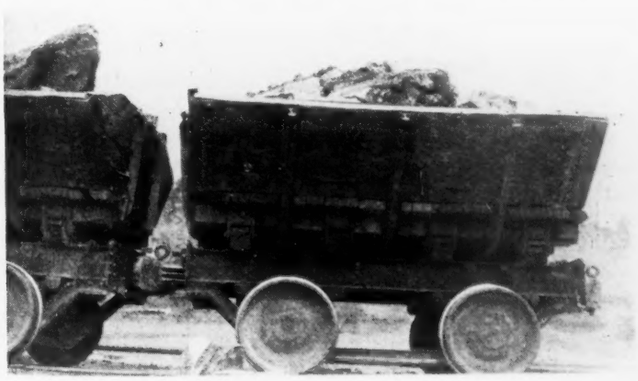
The dried stone and ashes are elevated to eight tanks, holding a total of 1350 tons. Each of these tanks has its own feeder and conveyor belt and these are operated by variable speed transmission gears.

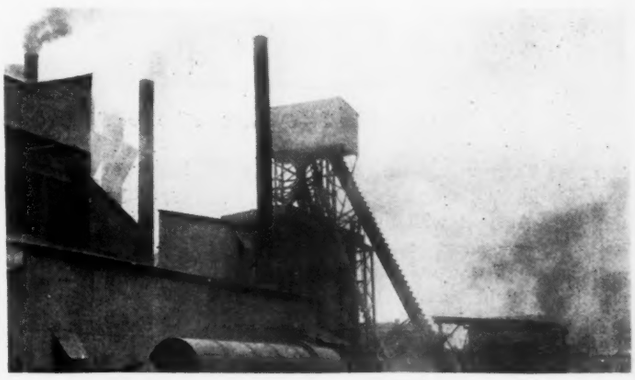
A fair average of the analysis of the ashes is 48% SiO_2, 3% CaO and 35% iron and alumina which are determined together. There is a little potash and some free carbon in the 14% of residue. The carbon, of course, is entirely burned out in the kiln.

The stone from the quarry carries about 1% of clay and this is allowed for in making up the mix. It also makes the stone sticky at times and one might mention here that a little "raw dust" is sprinkled on the jaw of the primary crusher whenever the clay tends to stick to the jaw, and this is found to be a satisfactory preventive.

The raw grind plant contains 18 Fuller-Lehigh mills of 42 in. diameter. The driving system is somewhat peculiar. There are eight mills, driven from line shafts connected to a 300-hp. synchronous motor. Five have each an independent vertical motor and there are four mills in pairs driven by two 150-hp. motors. The discharge of the mills goes to screw conveyors and these

New electric shovel which has a motor generator set and individual motors for different parts





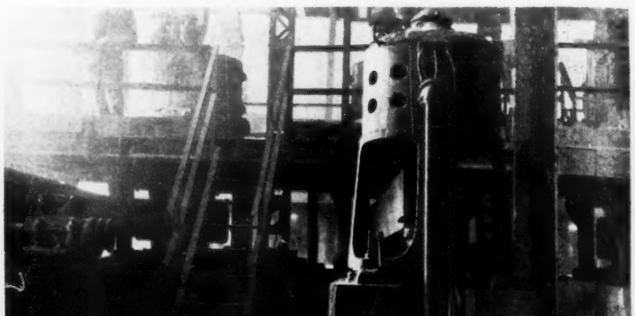
Left—Quarry car of heavy construction. Right—Elevator which lifts the crushed limestone from the track hopper to the dryer bins

take it to six silo tanks. Samples are taken from each tank hourly, both the inflow and the outflow. The feeders on the outlets of the tanks are set in accordance with the analysis of these samples, the "high" tank contents being mixed with the "low" tank contents in such a way as to preserve uniformity. A sheet with the hourly samples of the tank contents and of the resulting mix is constantly under the eye of the chemist and he can control the mix so closely that the hourly variation through the day is very slight indeed. Each kiln is fed by a screw conveyor and as the screw conveyor is always fully covered at the inlet the feed to the kiln is always the same.

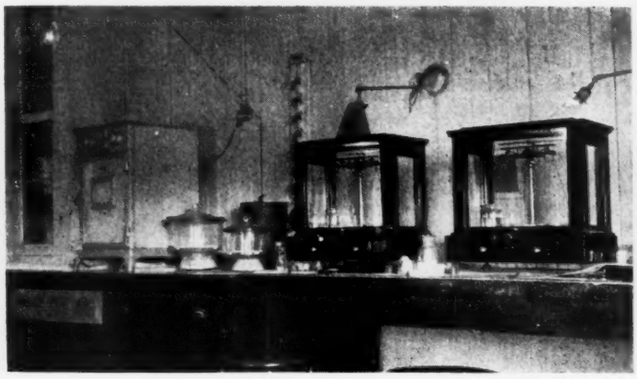
The kilns are peculiar in being "bottle shaped" instead of straight sided. They are 125 ft. long and the main section is 8 ft. in diameter, but a 50-ft. section at the burning zone is enlarged to 10 ft. diameter. This has been found not only to increase the capacity of the kiln but to improve the steadiness of the burning.

The kilns are fired with powdered coal which is pulverized in four Fuller-Lehigh mills and fed by screw conveyors to burners where it is blown in by air furnished by fan blowers. At present the coal is ground so that it all passes 40 mesh and 70% passes 200 mesh, which is coarser than it used to be ground.

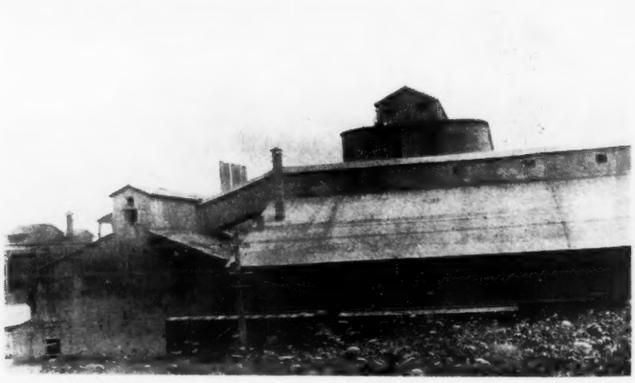
The cooling of the clinkers is another feature of the work that shows the great care that is taken to preserve uniformity. The hot clinker goes from the kilns to three elevators, two of which serve two kilns each while the third serves one kiln. Water is sprayed on the hot clinker to cool it and it was the previous practice to gage the flow of cooling water by the appearance of the cooled clinker as it went to the finish grind plant. The amount of water used in cooling was found to have a considerable influence on the quality of the finished product and to insure uniformity Nash water meters were installed. These were carefully calibrated and they are checked daily so that



Left—Exterior of raw-grind plant with kiln house in rear. Right—Interior of raw-grind plant showing individual motor for driving mill



Left—Exterior of finish-grind plant. Right—Chemical laboratory equipment



Left—Concrete silos for finished cement. Right—Exterior of packing plant

the cooling is always constant.

The readers of M. Duchez' articles on the constitution and composition of portland cement, which have been appearing in ROCK PRODUCTS (especially the article in the issue of July 26), will appreciate why this matter of cooling is so important. Mr. Duchez explains that the compounds formed by slow cooling are quite different from those of rapid cooling, owing to the completion of certain reactions which are checked by rapid cooling.

After cooling the clinker is elevated to the bins of the finish grind plant where it is ground in eight Griffin mills and four tube mills. The finished product goes to four large concrete silos, a quite recent addition to the plant. From these it is drawn off to conveyors and sent to the Bates valve bag packers, and either loaded into cars or sent on a conveyor to the stock house.

In such an operation as this, where the whole procedure has to be watched and

Charles H. Miller, the plant chemist

governed by analysis that goes on every hour of the day and night, the laboratory might well be called the heart of the plant. Charles H. Miller is the chemist in charge of both physical and chemical treating and he has an able corps of assistants. He obtained his training under Richard K. Meade of Baltimore. All the regulation tests are made including mortar strength tests with standard Ottawa sand, some of these being carried beyond the 7 and 28 day periods to three months, six months and one year.

E. S. Guth is the plant superintendent in charge of all operations. The company has an efficiency engineer, A. W. Cox, who is constantly studying the process, working out the details of improved procedure and seeing that the work of the various machines is up to the mark.

The stock of the company is mainly owned in Baltimore and Hagerstown, in which the main offices of the company are located. L. A. Cover is president, J. J. Porter is vice-president and general manager and A. M. Tyree is secretary and treasurer. He also holds the position of purchasing agent.

The company purchases its power from the Potomac-Edison Co.

Better Labor in the Building Trades

IN the labor mart everything is pointing to greater efficiency on the part of skilled mechanics through the constantly increasing number of men who are unemployed. The exterior trades have been hit the hardest through the completion of operations that were started last winter or in the spring. The result has been favorable to reduce costs in that greater production is being obtained on new work, the slow mechanic being replaced by a faster worker. This knowledge on labor's side naturally is reflected in their output, since a general contractor can readily put on the experienced man now through the availability of a plentiful supply. At this time last year there was considerable unrest among the crafts as they sought new wage agreements. This condition having been removed, capital and labor are working more harmoniously today than at any period since the war.—*Record and Guide.*

Adhesion of Gypsum Plaster to Concrete

IN a report published in the *Proceedings* of the American Society for Testing Materials, one of the conclusions reached was that a gypsum plaster could be made which would have under the same conditions approximately the same co-efficient of expansion as a concrete, provided the characteristics of the concrete were sufficiently studied. As this work was conducted upon gypsum obtained in the open market, the question arose as to the effect of age upon the volumetric properties of gypsum plasters. At the request of the gypsum committee of the American Society for Testing Materials this investigation was reopened by the bureau to answer this question.

Samples of freshly calcined material were obtained from mills located in various parts of the country, together with the sand used in different localities. From these materials test specimens were made, using the sand and gypsum which might be found in a given locality. These were tested for expansion, using the freshly calcined material, and there has recently been completed a series in which the calcined gypsum has been exposed to the air for a six months period. In each case the gypsum was analyzed to determine its composition. The results of this work bring out the following:

1. Freshly calcined gypsum shows a loss in $CaSO_4.\frac{1}{2}H_2O$ content on exposure.

2. Specimens made from aged plaster show a greater expansion and contraction with humidity changes than with freshly calcined material.

3. With a specific gypsum and a specific sand a gypsum mix can be made having approximately the same expansion under similar conditions as a concrete, provided a sufficient amount of data are available upon the expansion characteristics of the gypsum with the sand and the concrete in question.

4. In some cases a manufacturer has never experienced a failure of bond between gypsum plaster and concrete. This may be attributed to the composition of the calcined gypsum produced and that it was used unknowingly with such a proportion of the proper sand as to give a plaster which behaved similarly to the concrete with respect to expansion when subjected to the same conditions.

Between 800 and 1000 Trade Associations

IN connection with its studies of trade association activities, the National Industrial Conference Board estimates there are between 800 and 1000 such associations of national or interstate character in the United States. The latest list of commercial and industrial organizations issued by the Department of Commerce, with which the conference board co-operated in its recent canvass, contains slightly over 11,000 names and the present analysis of the board shows that about one-tenth of this number can be classified as true trade associations.

Of the 11,000 organizations listed by the Department of Commerce 1500 were interstate, national or international, 2000 state and 7700 local organizations. The board points out, however, that chambers of commerce and merchants' associations make up the vast majority of the organizations so listed and that many local organizations are only subsidiary units of larger associations.

In view of recent legislation touching upon the regulation of business by government, this analysis of types of trade associations is an important feature of the National Industrial Conference Board's attempt to clarify for the public and business community the present situation in the relation of trade co-operation and the federal anti-trust policy. As trade associations have become recognized as a representative medium for ameliorating trade abuses and improving industrial activity, the definition of what is a true trade association is of vital interest to business.—*Iron Age.*

Nebraska Highways

INTEREST in the good roads program indorsed by the Nebraska Good Roads Association and chambers of commerce of several cities of the state to grade 2100 miles, gravel and clay 3000 miles, and hard surface 500 miles of Nebraska roads, is gaining throughout the state. Nebraska at present has but 96 miles of graveled highways.—*Elwood (Neb.) Bulletin.*

Crushing Granite to Make Coarse and Fine Aggregate

Plant of the Stockbridge Stone Company, Near Atlanta, Georgia

AT Stockbridge, 18 miles out of Atlanta, Ga., there is a quarry which had produced crushed stone for 14 years. Four years ago it shut down, for the equipment was about worn out and capital was lacking to buy new. Last year Will McFarlin, of Birmingham, Ala., and his associates secured this property, recognizing that it afforded an excellent opportunity to build up a good business owing to the excellent market for all kinds of building material afforded by Atlanta and nearby towns.

The rock is a granite, known locally as a "bastard" granite because it has not the workability and the beauty that have made the granites near Stone Mountain, on the other side of Atlanta, famous. It is a rather fine grained rock but the crystals of quartz, feldspar and hornblende are plainly visible. At one time it was thought that the potash feldspar in this rock might serve as a source of commercial potash, as analysis showed that the rock contained 15% of potassium and 2¾% of sodium.

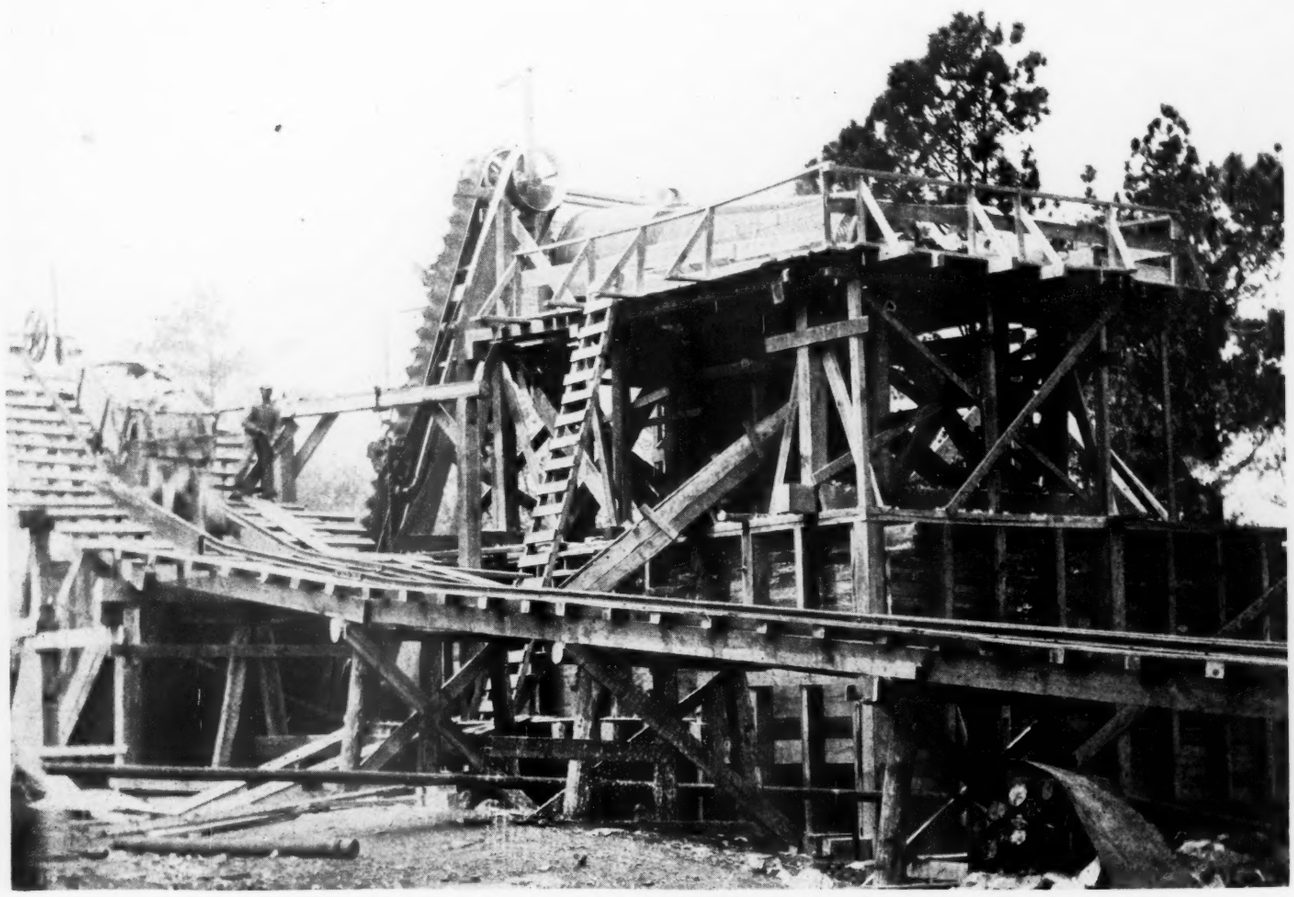
The new company, which is called the Stockbridge Stone Co., has built a plant at this quarry which is an excellent example of small plant design. The business is growing steadily and it is the company's intention to make additions to the plant which will bring its capacity up to 1500 or perhaps 2000 tons per day. The additions necessary to give it this capacity are a larger primary crusher and a steam shovel for loading in the quarry.

The quarry face is 34 ft. high and it is at present worked in two benches. Holes 18 ft. deep are drilled so as to bring the bottom of the lower hole a foot or two below the quarry grade. Sullivan D. R. 6 tripod drills with 1¼-in. bits are used for these holes and Ingersoll-Rand Jackhamers for drilling holes for pop shots.

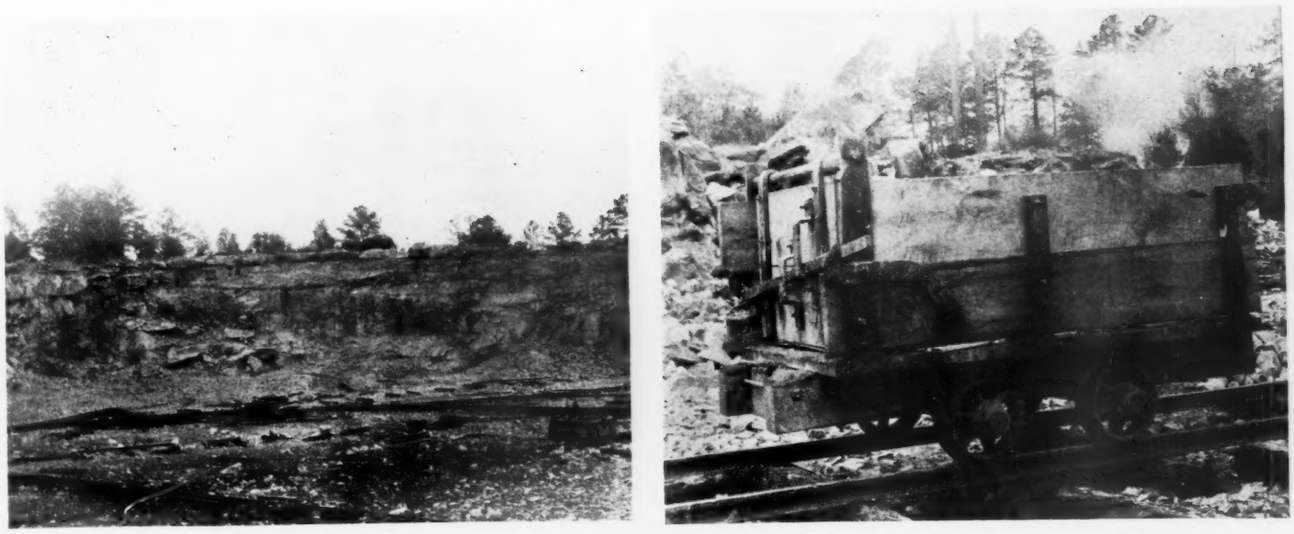
The holes are loaded in three sections of 6 ft. First 6 to 8 lb. of powder are placed in the bottom of the hole and well tamped to fill the first 6 ft. Then the next 6 ft. section and finally the third section are loaded in the same way. The holes are placed 6 ft. apart and with this method of loading good fragmentation is secured.

The quarry cars are "home made" and hold 2¼ tons each. They are loaded by hand and then drawn to the foot of the plant incline by mules. At present the extreme haul is about 150 yd.

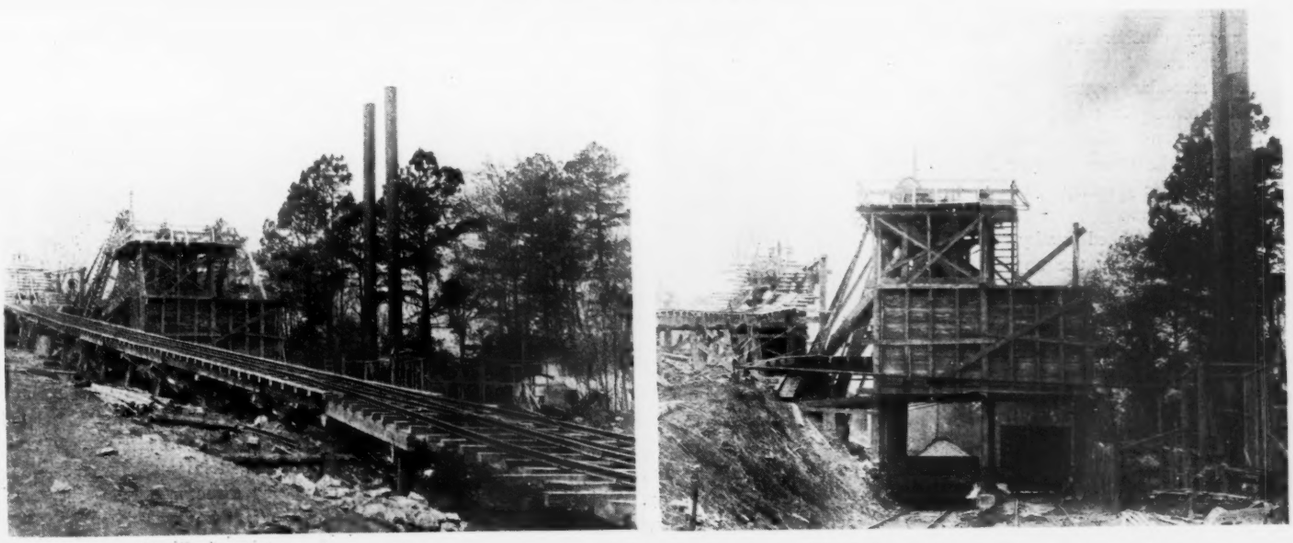
At the incline the cars are pulled up to the primary crusher by a 10x12 Flory hoist. The arrangement for unloading the cars is an excellent one. The incline itself is quite flat, rather less than 10 deg. from the horizontal. It curves up sharply at the upper end so that the car stands at about 45 deg.



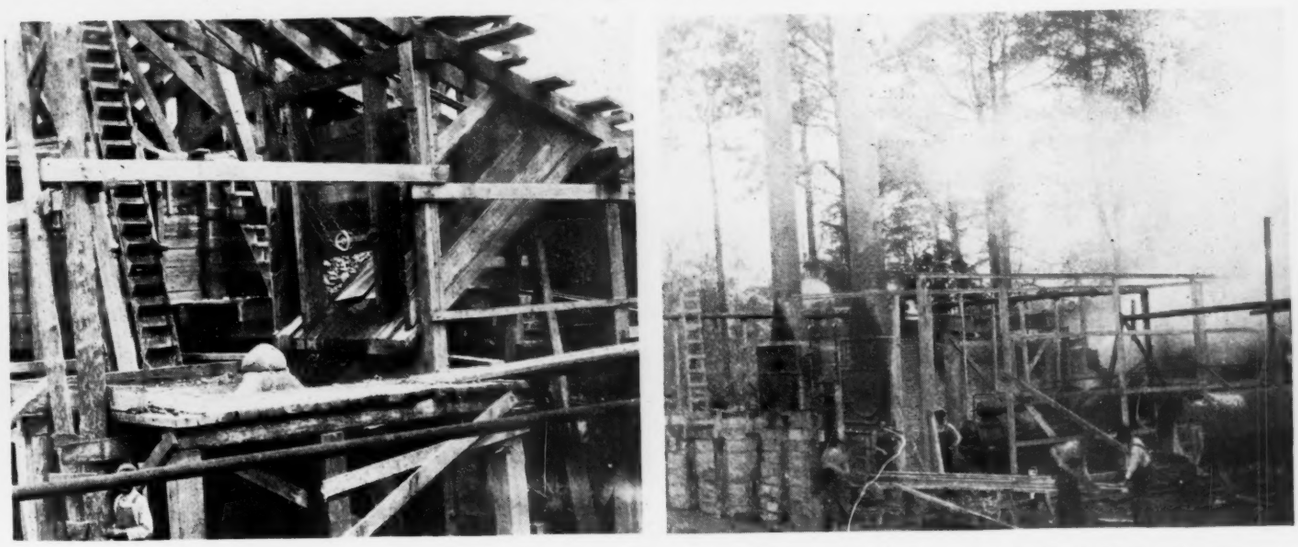
View of crushing and screening plant. Note car dumping to primary crusher at the extreme left of the picture



Left—Face of quarry which is 34 ft. high and is worked in two benches. Right—"Home-made" quarry car which holds 2¼ tons



Left—Incline from quarry to plant and new power plant. Right—End view of the plant. The secondary crusher is at the left of the bins



Left—Chute under the car dump and the primary crusher. Right—Power plant being covered in. Boilers and compressor are from the old plant. Note old boiler at right used as feed-water heater

where it is to be unloaded. A laborer strikes the latch on the end gate with a bar and the rock is discharged through a hole in the track to an incline which sends it to the primary crusher. There is no hopper. The man who dumps the cars signals the hooker-on below whenever a car is needed so as to keep the feed to the crusher even.

This primary crusher is a No. 6 McCully. The crushed rock passes from it to an elevator with 14-in. buckets and is fed directly to an Austin screen. Mr. MacFarlin built this elevator himself, buying only the belt and pulleys. It is of the continuous bucket type and the belt is supported on idlers placed about 4 ft. apart.

The Austin screen has 3-in., 1¾-in. and 1-in. round holes in the screen proper and ¼-in. round holes in the dust jacket. The chutes from this screen are so arranged that every product except the dust may be directed to any one of the four bins beneath. By the use of an auxiliary chute any of the coarser sizes may be sent to the secondary crusher to be recrushed to a smaller size.

The secondary crusher is a Kenedy-Van Saun No. 5. It takes the oversize from the screen and after crushing this oversize is sent to the same elevator that takes the product of the primary crusher which sends it to the screen.

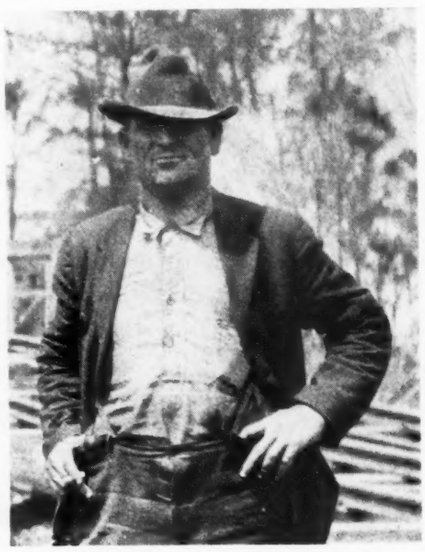
The dust is called locally "granite sand." It has more nearly the appearance of natural sand than the screenings from a crushing plant usually have, and it finds a market in Atlanta as fine aggregate for concrete.

The power plant is rather unusual in these days when electric power is so commonly used. It was the original intention to use electric power in this plant, but the rate offered was exceedingly high (about twice what power is sold for to plants in the Middle-West) and there was also the cost of building eight miles of transmission line to be considered. For this reason it was decided to put in a steam plant, especially as some steam equipment was already on the ground and could be utilized. An excellent grade of Kentucky coal with only 6% ash and with more than 14,000 B.t.u.s per pound is used as fuel.

In the power plant is a Norwalk air compressor that supplies air to the drills.

Water for the plant is pumped by a Deane direct acting steam pump from a creek below the plant, steam being carried through a line from the boilers. The water goes first to two old boilers which have been made into water tanks by putting in concrete heads. From these it passes to the intercooler of the compressor. From the compressor it goes to a "home made" heater, also made from an old boiler connected up so that the water is heated by the exhausts from the engine and compressor. The hot water is fed to the boilers by a Cameron feed pump. By this system a considerable amount of heat that would otherwise be wasted is returned to the boiler.

There is a belief among building supply producers about Atlanta that it does not pay to crush granite to make commercial crushed stone. Mr. MacFarlin has already proved the contrary for his case. He has been in various rock products industries all his life and knew what he was doing when he designed and built this plant. He was one



Will MacFarlin, vice-president and general manager of the plant

of the first to mine phosphate rock in the Tennessee fields and has been in charge of coal and ore mines at Birmingham as well as having conducted quarry enterprises. The plant was built by him without other drawings than the sketches he made for his own guidance.

The main office of the company is at Stockbridge, Ga. Carr McCormack is president of the company, Will MacFarlin vice-president and treasurer and E. M. Hamill is secretary.

News of the Canadian Portland Cement Industry

GOOD progress has been made by the Canada Cement Co. in the last four years in teaching safe habits to the workers. The following figures refer to the Montreal plant where there are over 600 employes.

	1920	1921	1922	1923
Lost time accidents	51	31	16	9
Accidents per million man-hours	23.4	16.7	9.3	4.5
No accident months	0	2	4	8
Compensation per cent of payroll	1.90	1.24	1.37	0.40
Production per man-hour	100	111	140	133

The results at this plant demonstrated that systematic education along safety lines will reduce accidents, save compensation expense, reduce production cost by increasing labor efficiency and reduce labor cost by decreasing labor turnover.

The Port Colborne plant of the Canada Cement Co., which in the four years 1920 to 1923, inclusive, had 42, 66, 16 and 21 accidents, has had only two accidents in 1924. The plant at Exshaw near Calgary, Alta., had 14 accidents in 1920, 8 in 1921, 2 in 1922, none in 1923 and 1 in 1924.

W. J. H. Cam, safety engineer of the Canada Cement Co., says safety work pays because it convinces the worker that the employer is out to give him a square deal and therefore develops his pride in the plant and loyalty to the company.

Cement Manufacture in British Columbia

The British Cement Co., Ltd., Belmont House, Victoria, B. C., possesses two plants about 15 miles from Victoria situated on tide water at Saanich Inlet. The larger plant on the east side of Tod Inlet has a capacity of 3000 bbl. per day and the other plant on the west side at Bamberton has a capacity of 2000 bbl. per day. The total cost of the two plants was approximately $3,500,000. The Tod Inlet plant uses limestone and clay and the Bamberton mill uses limestone and shale, all of which materials are obtained at or near both plants. The portland cement at both works is made by the wet process.

The cement shipped from both works is packed in jute sacks, filled by Bates valve bagging machines. Electric power is used. Shipments for use in the interior are lightered to the waterfront at Vancouver and are loaded into railway cars. The annual output of the British Columbia Cement Co. is 1,500,000 bbl. This is in excess of local consumption and an export trade is being developed. The cement business in British Columbia fell away to nothing during the war, but it has since revived and it is expected that there will be considerable building construction during the next few years, both private, industrial and engineering.

The managing director of the company is R. P. Butchart, who was born in Owen Sound in 1856 and went to British Columbia in 1904. He began in the hardware business with his father, Capt. G. M. Butchart, at Owen Sound in 1872 and near the same place in 1888 he started the first portland cement mill in Canada. He is also a director of the Pacific Steamship Co., Ltd., Seattle; Pacific Alaska Navigation Co., Tacoma; president of the Oregon Portland Cement Co., Ltd., Portland, Ore., and is interested in other cement companies in Canada and the United States.

Smoker Causes Fire in Quarry Change House

A FIRE at the "railroad quarry," about a mile above Shickshinny, Penn., destroyed the shifting shanty, two trucks and clothing of the men who used the shanty to change from shifting to working clothes. The fire is said to have been caused by a careless smoker.

The J. P. Howells Co. of Kingston is operating the quarry as a crushed stone plant.—*Shickshinny (Penn.) Echo.*

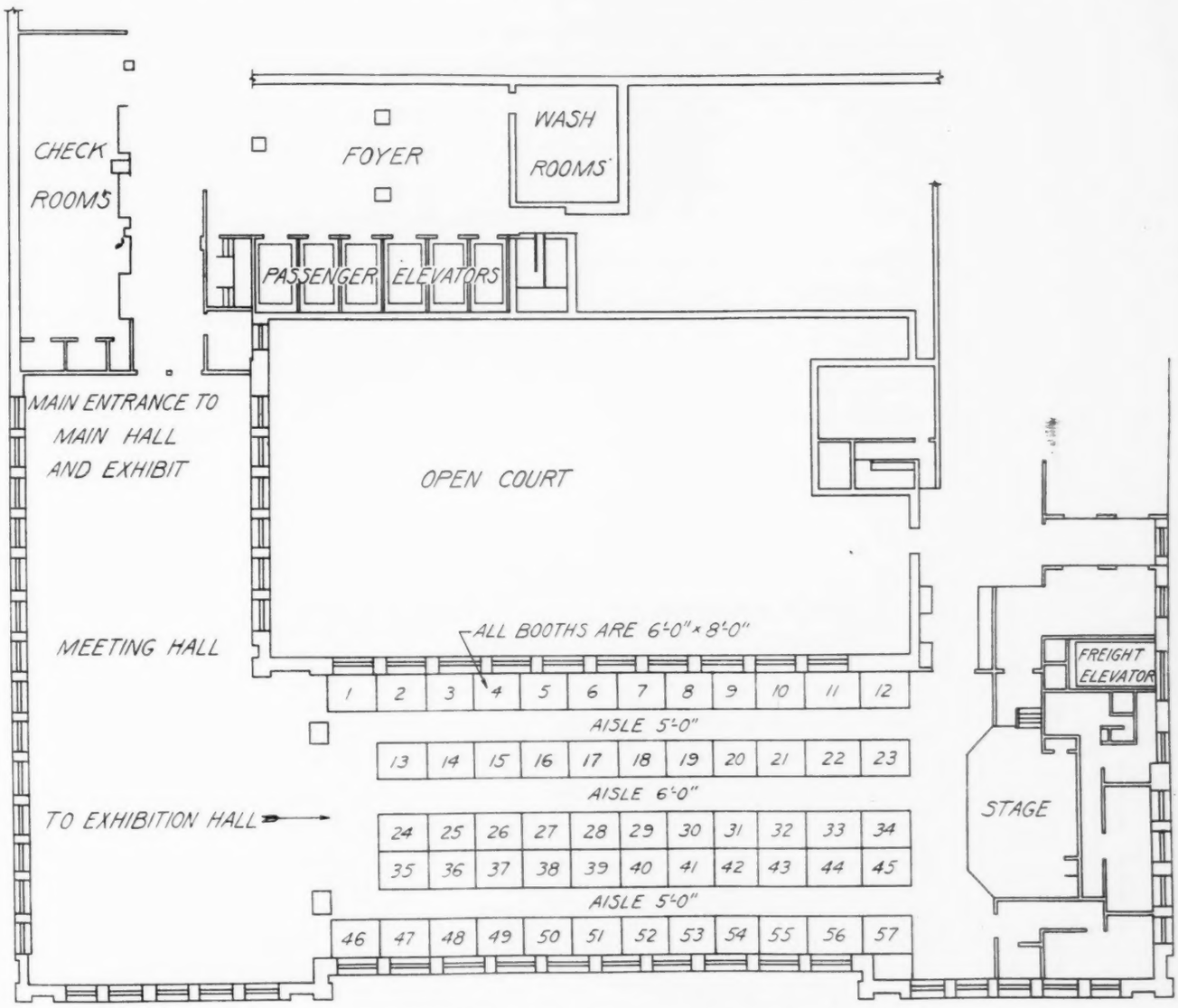
Plans for the National Crushed Stone Convention

AT a meeting of the Manufacturers' Division of the National Crushed Stone Association at New York City, October 24, the plan of exhibit space shown below was submitted for approval. It was voted to leave the assignment of booth space to the secretary of the division, and he is now at work on it. All associate members of the organization are expected to take exhibit space, some two or more booths and some half a booth, so that this exhibit will undoubtedly eclipse last year's.

The exhibit hall is entered through the general meeting room. Exhibitors will have an hour or so before the meetings begin in the morning, and most of every afternoon to show their wares. There is also a stage and curtain and moving pictures by exhibitors may be arranged for.

Manufacturers of quarry machinery and equipment who are not members, by vote of the New York meeting, will not be allowed to do business in the exhibit hall. New members will be welcome, and it is expected that by doubling up exhibit spaces by members who have no models or machinery to exhibit will permit space to be allotted to new members who join between now and the convention dates, January 12-15, inclusive.

No quarryman can afford to miss this exhibit of the latest things in quarry operation.


CHECK ROOMS
FOYER
WASH ROOMS
PASSENGER ELEVATORS
MAIN ENTRANCE TO MAIN HALL AND EXHIBIT
OPEN COURT
MEETING HALL
ALL BOOTHS ARE 6'-0" x 8'-0"
1 2 3 4 5 6 7 8 9 10 11 12
AISLE 5'-0"
13 14 15 16 17 18 19 20 21 22 23
AISLE 6'-0"
TO EXHIBITION HALL
24 25 26 27 28 29 30 31 32 33 34
35 36 37 38 39 40 41 42 43 44 45
AISLE 5'-0"
46 47 48 49 50 51 52 53 54 55 56 57
FREIGHT ELEVATOR
STAGE

NATIONAL CRUSHED STONE ASSOCIATION
CONVENTION AND EXHIBITION
HOTEL GIBSON, CINCINNATI, OHIO, U.S.A.
JANUARY 12-13-14-15 1925

Hints and Helps for Superintendents

Pulling a Quarry Car Both Ways Over a Hump

WIRE rope haulage offers many chances for an engineer to use his ingenuity. It is a simple proposition where there is a straight track and a regular incline, but where there are deviations from the straight line either sidewise, or up and down, the problem is not so easily solved.

One of the most interesting installations of rope haulage is to be found in the plant of the Stearns Lime Co. at Danbury, Conn. The track is not straight but is curved first to one side and then the other, and at the top of the incline there is a hump over which the car must be pulled to allow it to roll down by gravity to the plant.

The accompanying pictures show how this is accomplished. The sidewise motion of the rope, due to the bends in the track, is taken care of by self-centering guide rollers. These are double cones on which the rope slides easily to either side. When the rope comes back again to the roller it is kept from catching on the end of the roller by a bell shaped guard. When the car is near a roller the rope is in the center

One of the guide rollers for holding the rope on a curve

of the roller so that it gives the car a straight pull along the center line of the track. Vertical guide rollers hold the rope where it crosses a wide curve.

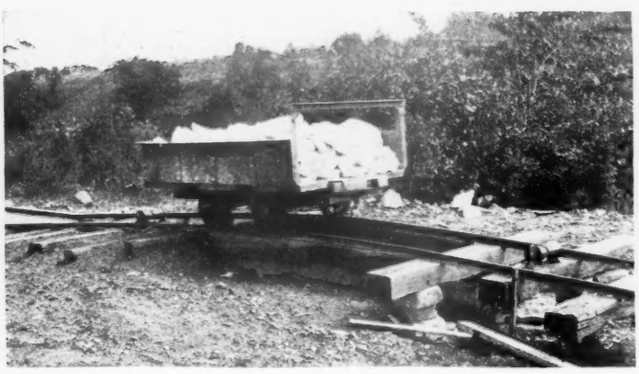
There is nothing novel in the use of these guide rollers, as they are standard equipment. But the method by which the car is pulled both ways so as to pass the hump is decidedly novel.

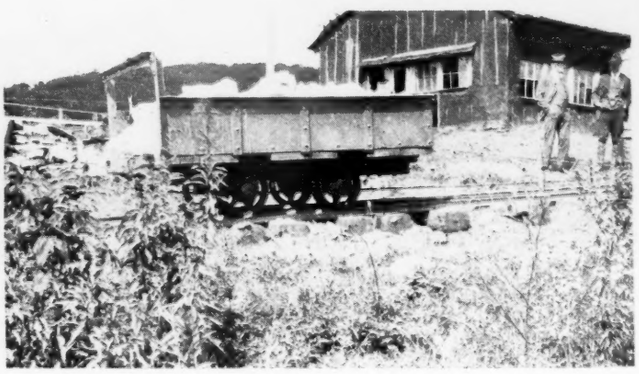
This is accomplished by a system of sheaves at the summit of the hump. There are four of these sheaves. Two of these are in line with the center of the track. The third is set below the others and at right angles to them, so that the rope is turned at right angles to the track and passes underground to a block and sheave fastened to a post, from which the rope goes to the hoist house at one side of the track. The first three sheaves, of course, are in a pit below the track.

The car is pulled up one side of the hump from the quarry, the rope working in one of the sheaves shown in the picture. When it reaches the sheave pit the hoist man shuts off the power and allows the car to roll over the pit by its own momentum. After it has passed the pit he controls the movement of the car down to the plant by gravity through the hoist brake.

As soon as the car has been dumped he reverses the operation, pulling the car up the incline until the pit at the top of the hump is reached, then shutting off the power and allowing the car to roll down to the

Left—View of the "hump" with the rope over sheave toward the quarry. Right—After the car has passed, with the rope on the sheave toward the plant





Left—The car just at the hump. Right—The car going down to the plant

quarry by gravity. The rope changes from one sheave to the other every time the pit is passed.

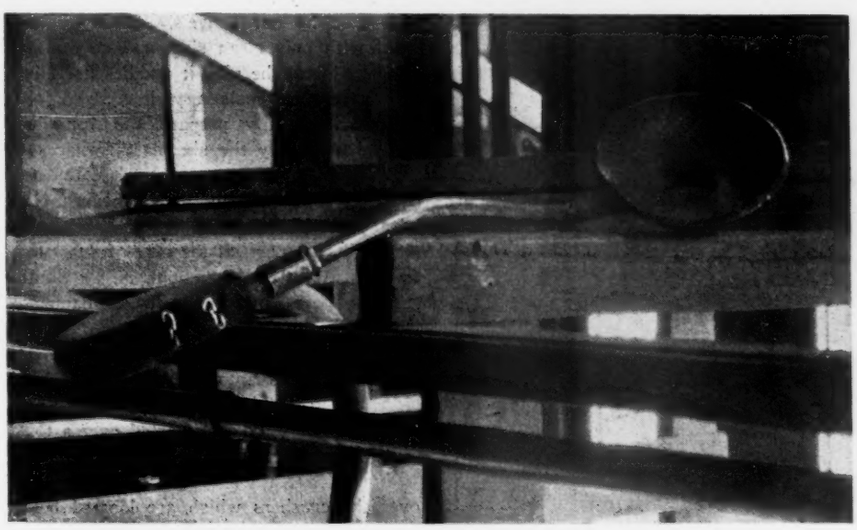
Device for Poking Out a Gas Main

AN ingenious device for poking out gas mains is in use at the Rockland-Rockport Lime Co. These mains carry the gas from the producers to the kilns. As the gas carries with it some solid matter the mains "soot up" and have to be cleaned out from time to time.

Clean-out holes are provided for this in the mains, and the original method of cleaning was to lift the cover of the clean-out hole and insert a poker, which was a pipe connected to a compressed air hose. The force of the air and the friction of the pipe against the side of the main worked the soot loose and blew it along the main.

This poking out was an unpleasant job as the draft created by the air jet blew gas and soot out into the room. To avoid this the device shown was designed by E. B. Packard, the superintendent of the gas-fired kiln plant.

The device consists of a "saucer" or plate, with a neck attached to drop into the clean-out hole. At one side and below the saucer a flattened pipe brings in a jet of compressed air through a hose. The mouth of this flattened pipe is set so as to blow air across the hole at an angle of 20 or 30 deg. with the horizontal. This stream of air not only keeps the gas and soot from coming out of the hole but it also helps to force the soot along the pipe.



This device keeps flame and soot from coming out when the gas main is poked

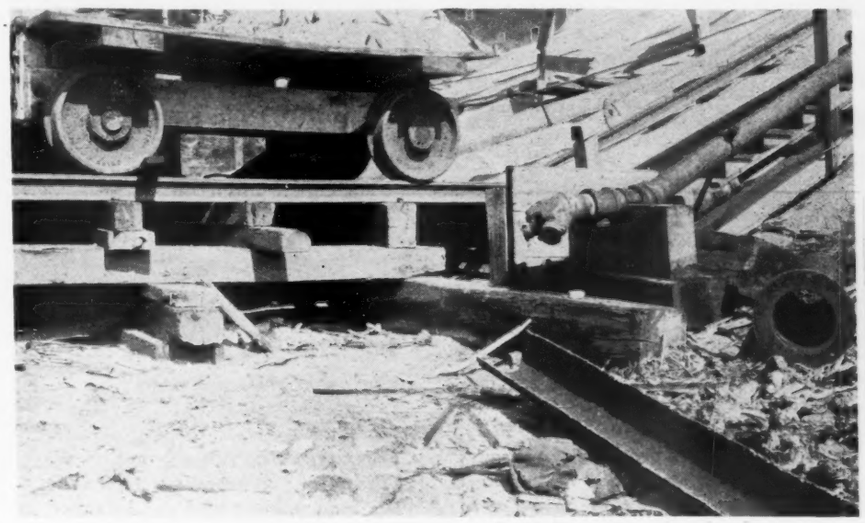
The poker is used as before and it is inserted through the hole in the saucer.

This is the sort of "hint" that ROCK PRODUCTS especially likes to publish. With practically no expense, a little ingenuity has turned a dirty and disagreeable job, which a man would naturally avoid as long as possible, and get through with as soon as he could, into one that can be done thoroughly and well without inconvenience or discomfort.

A Fire Protection Hint

AT the Scituate, Mass, plant of the Boston Gravel Co., good provision has been made for fighting fires in the plant. Not only has the plant been provided with pipe lines and outlets by which the pumping resources of the plant may be utilized but provision has been made so that the regular fire department of Scituate may aid in the work.

The picture shows one of the fire lines which runs along the incline by which the bank run material is drawn to the screening plant. The end of this line is provided with regular standard hose connections so that the city department may couple the fire engine to the line and thus utilize the plant system for fire fighting.



The standard hose connection on the right is for the fire department to couple on to the plant lines

An arrangement like this might save the plant if a fire occurred while the plant pump was out of commission temporarily.

Paint Keeps Lime Plaster from Setting

THAT oil paint applied to the surface of fresh lime plaster has a decided tendency to hinder the setting of such plaster is one of the conclusions drawn from a series of tests made by the Commerce Department's Bureau of Standards. The setting of the plaster results from the absorption of carbon dioxide from the air and the resulting change of the hydroxide, or slaked lime, into limestone.

This absorption of carbon dioxide is very greatly hampered by the paint film, the bureau finds. It is retarded, but not seriously, by a finish coat, and takes place more rapidly in lean mortars than in rich. The combination of a finish coat with a film of oil paint on top of it was subsequently tried, and was found to prevent the absorption of carbon dioxide almost entirely, cubes of plaster in this way showing no appreciable penetration of carbon dioxide after a period of six months.

In all, 144 two-inch cubes were made for the test. Four different types of lime were used, and the mortars were made in three different proportions of sand and lime. Twelve cubes were made from each mortar, of which four were left as molded, four were covered with a white finish coat, and four were covered with an oil paint. One-fourth of the cubes were tested each month to determine the condition of the lime and the amount of carbon dioxide absorbed.

Successful Merchandising of Crushed Slag*

Control of Slag Pouring—Developing Specialties—Selling on Merits

By C. E. Ireland
Vice-President and Sales Manager, Birmingham Slag Co., Birmingham, Ala.

Editor's Note

***EVERY** crushed stone, sand and gravel, as well as crushed slag, producer can profit by a reading of this article, which includes some of the principles for the successful merchandising of all these similar and competitive commodities. For however producers of sand, gravel, and stone may feel toward slag competition, they have got to concede that Mr. Ireland is about as live a salesman as there is in the industry.*

C. E. Ireland was born in Middle Point, Ohio, 38 years ago. His father, C. L. Ireland, of Van Wert, Ohio, was one of the pioneers in the crushed-stone business in the Middle West where he was associatd for over 25 years with the France Stone and Slag Co. interests prior to January, 1916.

On February 1, 1916, C. L. Ireland, with his three sons, H. G. (Glenn), C. E. (Gene), and C. B. (Barney), purchased and took over the management and operation of the Birmingham Slag Co., Birmingham, Ala., which had been operating a small crushing and screening slag plant for a limited commercial market since 1912. The old plant, which had an annual output of approximately 100,000 tons, was replaced in 1917 by the largest and one of the most modern electrically operated crushing plants in the United States. It is located on the property of the Tennessee Coal, Iron and Railroad Co., Ensley, Ala.

Although the new plant had a daily capacity of 4000 tons of slag, screened into seven standard sizes, it became necessary in 1919 to build a second plant of 2000 tons daily capacity, to meet the demand for screened slag in the six Southeastern States. This plant was built, along similar lines, on the property of the Gulf States Steel Co. at Alabama City, Ala.

WHEN the furnaces in the Birmingham district started producing slag it was necessary to dispose of it as cheaply as possible and to do this it was poured from tall trestles located near the furnaces. This method gradually built up mountains of slag which necessitated steep grades for the slag trains to climb or the spreading out over acres of valuable land. No care was exercised in pouring the slag in these piles to separate waste materials, such as flue dust, brick and other refuse from around the furnaces. During the reclaiming of slag from these piles, for marketing in a limited way, much of it was rejected by the consumer on account of the waste materials it contained. It was impossible for the excavating shovels to pick out the clean slag when poured in this manner. Most of this slag was marketed as railroad ballast, but even then the waste materials were objectionable in that they held moisture and shortened the life of the cross ties.

When crushed slag was first brought into use in 1912 in this district as a concrete aggregate, sizing was difficult as the waste materials were hard to separate from the clean slag. Slag on being poured from trestles down steep embankments cooled quickly and in thin sheets, which made it difficult to obtain a "roughly cubical" product especially desired when used as a concrete aggregate, as well as road metal in macadam road construction.

*Part of a paper read before the American Iron and Steel Institute, New York City, Oct. 24, 1924.

C. E. Ireland

To overcome the objectionable features of this method of preparing the slag for commercial use, the steel company and the slag company worked out and put into use in 1917, what is known as the modified pouring pit system. Under this system four pits, 1,000 ft. long, 50 ft. wide and 15 ft. deep, are used. These pits are adjacent and require only two pouring tracks, thereby reducing trackage to a minimum. They are located near the furnaces and alongside of the slag plant and are permanent inasmuch as they are constantly refilled when excavated by our shovels. These pits are filled with only clean slag, and as the slag is poured into the pits, it puddles itself into thick layers and cools very slowly.

To scientifically prepare the "puddled" slag produced by the six blast furnaces of the Tennessee company at Ensley, the slag company completed, in 1917, a modern, electrically operated crushing and screening plant. Its product, at the rate of 4,000 tons daily, is marketed throughout the six Southeastern States under the trade name of "Ensley basic slag."

Upon being excavated by electric shovels the slag breaks into large, solid, cubical pieces, is loaded into trains of three 20-yd. side-dump cars and transported over a third rail system to the crushing plant. The slag is dumped from these trains into a hopper over the crushers which are located below the ground level. It is fed to the crushers over a scalping screen which by-passes the small slag around the crushers directly into the skip-loading hopper. Large pieces of iron, sometimes 3 ft. in diameter, are caught going over the scalping screen and are removed by an electric crane for reloading to the furnaces.

Two 8-yd. skips are used to elevate the slag from the crushers to the top of the

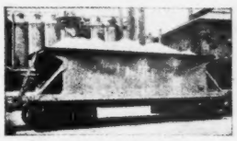
Pure molten Slag—*free from all dry refuse*—

being poured at Ensley into our modified pits

The pure molten slag is carried from the furnaces, 1000 ft. away, in hot pots and poured by the T. C. I. & R. R. Co. (U. S. Steel) under our direction into modified pits—dry slag canals.

Blast Furnace Slag is scientifically handled in this manner only at two points in the South—at Ensley, Ala., on the property of the T. C. I. & R. R. Co., where "Ensley Basic Slag" is produced and at Alabama City, Ala., on the property of the Gulf States Steel Co., where "Alabama City Basic Slag" is produced. Incidentally at these points, and by these two steel corporations only, is Basic Slag produced.

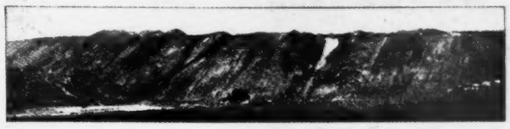
The railroad car above is filled with downcomer dust, brickbats and other dry refuse which accumulates daily from the six blast furnaces at Ensley. Prior to 1912—year we started to crush and screen slag—all of this "foreign" material was dumped with the Slag. It all went into the slag pile together.



Now the dry refuse is dumped separately. The car you see is one in a train of eight on its way to that mountain, in the lower picture, which is two miles west of the blast furnaces. More than two million tons of downcomer dust, brickbats and other dry refuse in this giant pile have accumulated since 1912.

Our next statement, "Why Slag is poured into modified pits" will appear shortly in this magazine.

Birmingham Slag Co.
Slag Headquarters for the South
ATLANTA BIRMINGHAM THOMASVILLE



Manufacturers Record July 24, 1924 Exhibit No. 93-C

To prolong the annealing process—and to make the Slag thicker and tougher—it is poured into Modified Pits

Under the old method, still used by a few producers, the Slag was poured over high banks and allowed to run down by gravity to a feather's edge. The thin strata cooled quickly and, when crushed, the Slag was too friable and there was an excessive percentage of flat, elongated pieces.

The modern scientific way of pouring Slag into modified pits enables us to definitely control the thickness of the strata—and to prolong the cooling and annealing process.

How exactly does that improve the product?

When Slag is poured in thick strata, it breaks up in much more *cubical* pieces when excavated by the powerful electric shovels and run through the big gyratory crushers.

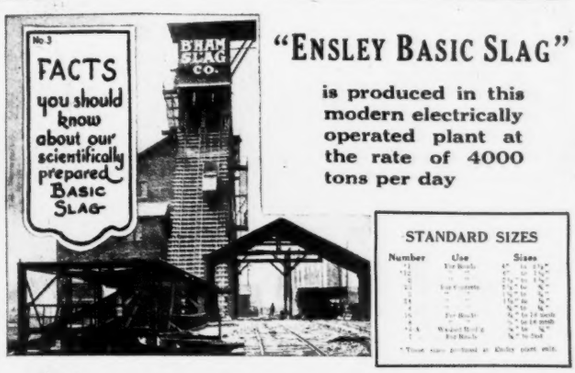
You steady users of slag "aggregate" know how important that is. Also you know from experience that when Slag is cooled slowly there is a marked increase in its solidity, toughness and strength.

"What happens after the slag leaves the modified pits" is the subject of our next statement. Watch for it!

Birmingham Slag Co.
Slag Headquarters for the South
ATLANTA BIRMINGHAM THOMASVILLE

The two modified pits are dry canals about 15 ft. deep and several thousand feet long. Photo shows one of the big electric shovels excavating the slag from the pits and loading cars dumped by electric locomotives over a third rail system to the crushing plant.

Manufacturers Record August 21, 1924 Exhibit No. 93-D



"ENSLEY BASIC SLAG"

is produced in this modern electrically operated plant at the rate of 4000 tons per day

STANDARD SIZES

Number	Use	Sizes
*1	For Roads	4" to 2½"
*2	"	2½" to 1½"
3	"	1½" to ¾"
4	For Concrete	¾" to ⅜"
5	"	⅜" to ¼"
6	"	¼" to No. 8
7	For Roads	¼" to 10 mesh
8	"	¼" to 16 mesh
*8A	Waterproofing	¼" to 30 "
9	For Roads	¼" to Dust

*These sizes produced at Ensley plant only.

—processes of crushing, screening and sizing to exact specifications

What becomes of the Slag after it leaves the modified pits?

It is brought by electric locomotive trains to a modern electrically operated crushing plant.

Skip cars carry it from the two gyratory crushers up a steep incline to the top of the screening plant and automatically dump it into a big bin.

The crushed Slag then passes over two magnetic rolls, for removal of small pieces of free iron, and into two revolving screens 26 ft. long and 5 ft. in diameter.

The ¾ inch to dust material is first removed from the crusher run slag and passes down chutes to four electric vibrating screens where it is separated into four sizes—Nos. 4, 5, 6 and 7.

After the ¾ inch material has been removed the coarser slag is separated in the big revolving screens into six sizes—Nos. 1, 12, 2, 2½-3, 34. All Slag over four inches is returned to the rebreaker crusher by gravity chute.

Plant No. 2 at Alabama City, Ala.: electrically operated throughout; daily capacity 2000 tons of "Alabama City Basic Slag."

The sizing completed, the Slag drops into concrete storage bins from which it is loaded into cars directly underneath and weighed on railroad track scales.

All weights are certified by the Southern Weighing & Inspection Bureau and delivered by our own locomotives to the ten trunk line railroads serving the Southeast. This method saves from two to five days in the handling of every shipment and assures uninterrupted, prompt service—a factor of first importance to every user of "coarse aggregate" and "road metal."

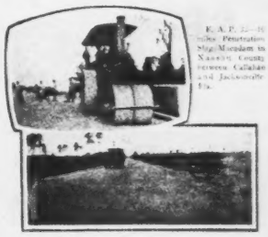
Birmingham Slag Co.
Slag Headquarters for the South
ATLANTA BIRMINGHAM THOMASVILLE

Manufacturers Record September 18, 1924 Exhibit No. 93-E

FACTS

You Should Know About Our Puddled

"ENSLEY" & ALA CITY
BASIC SLAG
CRUSHED & SCREENED



E. A. P. C.—R. Ocklo Penetration Slag Macadam in Nassau County, between Callahan and Jacksonville, Fla.

More than one million tons of our scientifically prepared Basic Slag used during 1923 in Roads, Pavements, Bridges, Buildings and Railroad Ballast

Twelve years ago Slag was a waste product.

Today it ranks as one of the South's most dependable "building" products—used with uniform success in all types of city pavements and hard surface highways—lending "the strength of steel" to all forms of modern concrete construction.

Last year the South broke all construction records—both for buildings and roads.

The Southeastern states alone used more than one million tons—25,905 cars—of our Basic Slag in concrete buildings, bridges, highways and city pavements; in Asphaltic Concrete, Watrenite Bituthic, Short Asphalt Border, Penetration Macadam, Surface treatment; in built up roofs and for railroad ballast.

"Ensley Basic Slag" and "Alabama City Basic Slag" is a scientifically prepared product.

It is poured under our direction into modified pits. It is crushed, screened and sized in a modern, electrically operated plant. A product that meets the exacting requirements of architects, engineers, contractors and State and Federal Highway Departments.

So much for the story of Basic Slag.

Let's go back of the scenes a moment. What is done to Slag after it leaves the furnace? Why is it called "scientifically prepared product?"

The story is told in three short, simple statements the first of which will appear shortly in this magazine.

Six million dollar Atlanta-Biltmore Hotel one of the imposing structures erected in Atlanta in recent years.

Birmingham Slag Co.

Slag Headquarters for the South
ATLANTA BIRMINGHAM THOMASVILLE

Manufacturers Record July 10, 1924 Exhibit No. 93-B

screening plant, where it is fed into the screens over magnetic rolls which catch all free iron and all slag that contains iron, dropping it into a separate bin for loading into cars for reclaiming for the furnaces. In passing through the screens nine different sizes of slag are produced, ranging from 4 in. down to dust. These standard sizes are used in many types of construction—namely concrete highways, bridges, reinforced buildings, waterbound and bituminous macadam, asphalt concrete, sheet asphalt, Warrenite-Bitulithic and other patented types of pavement.

A specially sized slag, from 6 to 20 in., is produced for the United States government and used on the Mississippi River banks as rip-rap and for mattress beds on the floor of river. During the past three years approximately 80,000 tons of this size have been used for this purpose.

Slag has been found ideal for highway construction on account of its toughness and natural bonding properties. It has also been used in sewage filtration plants and built-up roofs with much success. Large quantities are used by the railroads for ballast, and during the past few years some of the railroads have found that a screened slag with the fines taken out, makes a better ballast than the bank run slag, and that even at a higher price is the most economical in the end.

After a period of years a rate structure for slag was built up and at the present time covers shipments to all points in the Southeastern States. During this time the use of the slag was promoted as an equal to gravel, granite and crushed stone when used as a concrete aggregate and a long series of tests were carried out to prove the equality. Even then some engineers did not accept the results of these tests and many questions, such as the effect of the sulphur in the slag on reinforcing steel were brought up and successfully thrashed out in favor of our slag. As a result of this series of tests our slag was found to produce a stronger concrete than stone, granite or gravel, due to its angularity forming a more perfect bond with the mortar. Today this fact is accepted by most engineers and our slag is favored by them on account of the dependable quality and grading of the various sizes.

The demand for blast furnace slag produced in this scientific manner has gradually increased each year and at the present time about 60% of the slag produced by the furnaces in this district is sold commercially. During the year 1923 over 1,000,000 tons were shipped by our company alone—approximately 26,000 carloads.

An example of some of our advertising, in the *Manufacturers' Record*, is shown on the preceding page.

[An article, abstracted from this same paper, on the cement products part of the business of the company, appears elsewhere in this issue.]

Two and Two Should Make Four!

The Screenings Pile and a Place to Use It

A FRIEND of ours in Pennsylvania sends us the accompanying view of his waste screenings pile—350,000 tons—and asks suggestions for utilizing this material. He already makes all the agricultural limestone, asphalt filter, etc., that he can market. He is a live wire, and is considering cement products manufacture as a possible activity.

The pile of screenings contains 350,000 tons. The day is not far distant when such material should be sold for ballasting pavements

It so happens that the photograph and letter referred to above, in the editor's file, got attached to a report of the U. S. Bureau of Public Roads on a concrete test road in Pennsylvania. One of the purposes of this test road is: "To determine the influence of subgrade material on the strength of the pavement." From the results of the test it is hoped that an answer will be found to the following question (among others): "Will a 4-in. layer of good material improve the strength of a concrete road when laid on a poor subgrade material?"

We believe most any experienced engineer could answer that question now. Probably they merely want to convince the non-technical highway officials who control the purse strings. What railway maintenance-of-way engineer would lay main-line track on mud ballast? The heaviest rails a steel mill could roll and the best white oak ties would not make it a good track. The same reasoning applies to highways. The best concrete will not make a good pavement when laid on mud or loam.

Do you get the point? The day is not far distant when, if you are any kind of a salesman, and highway officials are anything but just plain dumb, you will find a market for your present waste screenings, and sand, for ballasting pavements. The strange thing is that it has taken highway engineers so long to accept a practice that railway engineers learned in the pioneer days of railroading.

Minnesota Agstone

THE St. Paul firm from which most of the ground limestone for Carlton county has been obtained has announced that after November 1 the price will be increased from 50 cents a ton f.o.b. St. Paul to $2 a ton at loading point. Farmers in Carlton county who are interested in lime will save money if they place their orders at once, as, it is asserted, there is very little prospect of lime again getting back to present prices.

Farmers who are not considering planting alfalfa for a year or two, but who eventually will put in a plot, will do well to apply their limestone this fall so that it will get worked into the soil.—*Duluth Herald.*

Hydraulic Limes, Natural and Artificial

Comparison with Other Limes and Cements and Their Properties, Uses and Manufacture

By Dr. C. R. Platzmann
Berlin, Germany
Written Especially for Rock Products. Translated by R. W. Scherer, Milwaukee, Wisconsin

LIME is obtained by burning limestone below the sintering temperature. We distinguish three kinds of lime: (1) quicklime, (2) weakly hydraulic and (3) strongly hydraulic lime.

In burning quicklime it is essential merely that sufficient heat be maintained to expel the carbon dioxide, entailing at the same time a shrinkage in volume of 13 to 14%. The slaking of quicklime and the subsequent hardening are brought about by the following chemical reactions:

$CaO + H_2O = Ca(OH)_2 + 277$ calories per kg. (slaking).

$Ca(OH)_2 + CO_2 = CaCO_3 + H_2O$ (hardening).

The quicklime (CaO) has a specific gravity of 3.3, while that of the slaked lime ($Ca(OH)_2$) is 2.5. In slaking, considerable heat is generated; the lime increases in volume and breaks up into a very finely divided soft powder. Hardening, as shown by the above equation, depends on the absorption of carbonic acid gas from the atmosphere forming calcium carbonate, which is the same substance as that contained in the original limestone. Quicklime is therefore "air hardening." It is generally used for lime mortar in the following mixtures: For mason's mortar, 1 part of slaked lime to 3 of sand; for finish mortar, 1 part of lime to 2½ parts sand. Besides this, burned lime finds a use as soil sweetener in agriculture, for the production of sand-lime brick and in chemical industries.

Definition of Hydraulic Lime

The term "hydraulic lime" without other qualification to indicate its many varieties is used to designate materials which are produced by burning (also without sintering) limestones containing clay or magnesia to produce a substance which will of itself harden under water by a process of hydration. The immediate cause for hardening in this case is not the absorption of carbonic acid gas from the air but the formation of new mineral compounds containing water (crystallization). In burning, after the expulsion of the CO_2 a reaction takes place between the solid substances, lime on the one hand and silica, clay and iron oxides on the other, by which there is an increase in the percentage of substances soluble in hydrochloric acid.

Hydraulic limes are successfully used under water when the action of water follows after a sufficient initial set in air. They are also preferred for mason's and finish mortar when there are special requirements in strength and weather resistance. The weakly hydraulic limes are especially suitable for high buildings and all kinds of masonry where a more rapid setting of the mortar is desirable. For structures under water these limes are given an admixture of cement or of other hydraulic substances, such as trass or slag, because by such additions the hydraulic properties and possibility of hardening are increased. Finally, weakly hydraulic limes find uses in agriculture, for sand-lime brick and for various technical purposes. Average mortar tests of hydraulic lime in 1 to 3 mixtures with sand and stored 72 hours in moist air, the balance of the time under water, show the following strengths:

	Pounds per sq. in.				
	7 d.	28 d.	90 d.	180 d.	365 d.
Tensile strength..	98	184	252	350	378
Compression	378	756	1316	1764	2141

The approximate composition appears from the following comparative table of percentages:

	CaO(MgO) after burning	Clay content SiO_2 Al_2O_3 etc.	Water content after slaking
Quicklime	90 to 100	0 to 10	25 to 26
Weakly hydr. lime	85 to 90	10 to 15	20 to 24
Strongly hydr. lime	65 to 85	15 to 35	17 to 22
Roman cement	55 to 60	40 to 45	....
Portland cement....	60 to 65	35 to 40	....

There is great difference of opinion as to what is defined exactly by the term hydraulic limes. In 1879, Hauenshild defined them as limes which are obtained from natural stones, which, after burning, slake to a powder with water and which harden under water after shorter or longer periods. The types of such limes are Chaux du Teil in France, the Bekumer and Trier limes in Germany and the lime of Prague in Czechoslovakia.

Natural and Artificial Hydraulic Limes

In 1904 Schoch urged the distinction between natural and artificial hydraulic limes and further classified them as follows:

(1) Natural Hydraulic Limes.
(A) Real hydraulic limes with over 70% of calcium carbonate.
(B) Roman cements with 50 to 70% calcium carbonate.
(C) Dolomitic or magnesian limes.
(2) Artificial Hydraulic Limes.
(A) Lime with admixtures of natural materials (Puzzolan cement, Santorin cement, trass-lime mortar).
(B) Lime with additions of artificial materials (slag-cement).

According to the Swiss standards of 1909 for uniform designation, classification and testing of hydraulic "binders," hydraulic limes are products made from marl or silicious limestones by burning these at less than the sintering temperature and by subsequent hydrating and powdering.

According to the standards set up in 1911 by the German Association of Lime Works, the following definition of hydraulic limes applies:

(A) Weakly hydraulic limes are obtained from limestones by burning at less than the sintering temperature; they slake like quicklime, but do not swell quite so much. Left in a slaking pit they become hard after a time. The mortar from these limes hardens in the air by the absorption of both carbon dioxide and water, and after sufficient hardening in the air it will continue to gain

THE production of hydraulic lime in the United States is very small, but so long as a considerable quantity is imported yearly it has something more than an "academic" interest for the lime industry, especially as the raw materials are widespread and abundant. As Dr. Platzmann points out, these limes are to be preferred when there are special requirements for durability and weather resistance. The accompanying article by a leading German authority describes definitely just what hydraulic limes are and how they differ from such substances as natural and portland cement and from ordinary quicklime. Both in England and on the Continent the hydraulic lime industry is highly developed and many brands are on the market.—The Editors.

strength under water. They require a considerable time for hardening in air, never less than seven days, at the most 21 days, before they may be exposed to the action of water. With hydraulic additions (cement, trass, etc.) they may be used under water sooner. Limes which require more than 21 days of air hardening to withstand the action of water are to be classed as quicklimes.

(B) Strongly hydraulic limes are products obtained by burning limestones below the sintering temperature and having the following properties: In dry slaking, they crumble to powder, swell slightly and develop heat. Their mortars harden in air, and after sufficient air hardening, not to exceed seven days, continue to harden under water.

It is quite apparent that conceptions of the term hydraulic lime are greatly at variance. We can, however, consider as definitely determined the fact that the only limes which can be designated as hydraulic are those which are produced by burning natural stone below the sintering temperature and to which no other ingredients have been added. Products not made from natural limestones or dolomites, or to which other materials have been added either before burning or during or after the burning process, can not be classed as hydraulic limes in the true sense of the word, but are mixtures for which a special designation would be appropriate. This applies especially to some of the "extra-limes" such as Meteor, Gloria and Metropole limes and silikalit (all of which are German products).

Manufacture of Hydraulic Limes

For the manufacture of hydraulic limes the same kilns serve the purpose as those which are used for burning quicklimes. A detailed description of these kilns is therefore superfluous.

Choice of the most suitable kilns for the purpose depends on the character of the raw material and fuel available and the rate of production demanded. The occurrence of the raw material is in many varied forms. In one instance the lime is found in meadows (Wiesen-Kalk) under a layer of turf a yard deep; it is cut into cubes, stored for drying, burned for 24 hours and then ground.

A Hessian hydraulic lime is burned in an ordinary shaft kiln using coke as fuel. (Coal is generally used in the circular kiln or *"Ring Ofen."*) A dolomite from Rhenish Prussia is burned in a circular kiln at 950 to 1000 deg. C. (1800 F.) and is marketed in large pieces or as hydrated lime in sacks. To produce 200 tons of lime, 396 tons of this dolomitic limestone are required.

A certain clayey limestone in Silesia is quarried and broken to about 6-in. pieces and then calcined at 1000 to 1100 deg. C. and while still hot is dashed over with water; after two hours of cooling the lime is ground in a ball mill provided with screens and then sacked. Separation of the ground lime is in most cases carried on by air separators.

A marl from Brandenburg is burned at about 1000 deg. C., is slaked with water and then left standing for six weeks. Before grinding in the ball mill 10% of well slaked but underburned lime and 5% of cement clinker are added.

It is apparent from these different cases that the actual burning process offers no great technical difficulties. The kilns to be used are such as we are familiar with and the slaking and grinding are simple processes employing only well known and approved machines.

Properties of Hydraulic Limes

The physical properties of hydraulic limes, i. e., of the calcined product include the following:

1. *Lime Content.* This is lower than that of quicklime but higher than that of portland cement. It varies between 65 and 85%.

2. *Loss on Ignition.* This amounts generally to from 17 to 22%, is lower than in quicklime but greater than in cement.

3. *Color.* The color of slaked hydraulic lime depends on the raw material and varies greatly, while slaked quicklime is white as a rule, giving rise to the designation "white lime."

4. *Weight.* Hydraulic lime weighs considerably less than cement but more than quicklime. The comparative weights are as follows:

	Pounds per cu. ft.	
	Loosely filled	Shaken
Hydraulic lime	25 to 43.5	43.5 to 75
Quicklime	25 to 31	40.0 to 47
Portland cement	62 to 84	112 to 124

The specific gravity is similarly lower in quicklime than in portland cement; it depends on the density of the original stone, the burning and the slaking.

5. *Strength.* The strength of hydraulic limes is higher than that of quicklimes but very much lower than that of portland cement. All these properties are direct functions of the physical structure and manner of burning the raw material, and especially are they dependent on the proportions of lime and clay. A definite lime content is essential in the stone so that not all the lime shall be combined with the clay and that as much lime remains free as may be necessary to slake the burned material. For this reason it is doubtful whether the Roman cements, in which all the lime combines with clay, may be rightly classed with the hydraulic limes. The products marketed as cement-lime are not different either in process of manufacture or in their properties from ordinary hydraulic lime. Besides these a number of limes are offered which show extraordinary strength, approaching that of portland cement, and which are invariably specially prepared or mixed products. (Described in Rock Products, May 17, 1924.) The examination of a hydraulic lime should cover the following determinations:

1. Slaking and yield.
2. Weight (specific gravity as well as dry weight), loosely filled into container, shaken down and tamped down.
3. Screen analysis.
4. Initial set.
5. Soundness
6. Plasticity.
7. Yield of mortar.
8. Tensile and compressive strengths of mortar.
9. Adhesion.
10. Chemical composition.

Composition of Hydraulic Limes

The percentages of the ingredients of hydraulic limes vary within the following limits, according to examinations made by Burchartz at the government testing laboratory at Berlin:

	Per cent
Silica (SiO_2)	3.94 to 23.11
Clay (Al_2O_3)	1.22 to 14.86
Lime (CaO)	60.01 to 88.98
Magnesia (MgO)	Traces to 6.20
Anhydrous sulphuric acid (SO_3)	.13 to 3.53
Insoluble residue	Traces to 7.02

It is apparent that even in this group (the true hydraulic limes) great variations occur, especially in the percentages of silica, clay and lime. Quite distinct from these are the dolomitic limes low in calcium but which have a great content of magnesia and less silica. The constituent parts vary within the following limits:

	Per cent
Silica	2.21 to 4.16
Clay with iron oxide	2.20 to 28.76
Lime	53.77 to 56.33
Magnesia	10.76 to 38.89
Sulphurous anhydride	.32 to 1.54
Insoluble residue	2.77 to 6.00

The writer is familiar with a large Rhenish plant in which hydraulic lime is produced from dolomite burning at 1000 to 1200 deg. C. in a circular kiln, while the same quarry stone is used in a neighboring plant for producing refractories by dead-burning at temperatures of 1400 to 1600 deg. C. From my own determinations this dolomite has the following composition:

	Per cent
Silica	.84
Alumina and iron oxide	1.88
Lime (CaO)	31.67
Magnesia	20.51
Loss on ignition	45.00
	99.90

These figures are for the uncalcined stone as against the figures for burnt lime given above.

Besides distinguishing weakly hydraulic and strongly hydraulic classes, hydraulic limes can be further classified as:

1. Natural hydraulic limes.
2. Dolomitic limes.
3. Special or "extra" limes.

The first two classes have been discussed above; on the third class, the special limes, a detailed report was given in these pages recently (See Hydraulic Cements by Addition of Certain Minerals to Lime in Rock Products for May 17) and the results of further research by the writer are given below. To show the great variation in composition and properties as well as the designations, there are given with this a selection from the large number of specimens examined by the testing laboratory and reported by Burcharzt. (See accompanying table.)

The writer's own investigations on various

COMPOSITION AND TENSILE STRENGTH OF VARIOUS LIMES

	Loss on ignition	SiO_2	Al_2O_3 Fe_2O_3	CaO	MgO	SO_3	Insoluble residue	Alkaline remnant	28 day mortar strength, lbs. per sq. in., Tensile	Comp.
Calcium Limes—										
Black lime	17.21	16.66	9.45	65.01	1.47	0.74	7.02	.....	.....	.....
Hydraulic lime	21.04	20.35	8.35	67.45	1.32	0.68	.....	1.85	37	114
Cement lime	16.32	12.31	7.85	68.58	0.71	3.29	6.56	0.70	70	242
Lean lime	14.98	15.71	2.58	75.76	.....	0.40	5.47	.....	86	312
Cement lime	4.87	10.73	4.04	81.81	0.84	1.40	.....	.....	65	341
Marl lime	5.66	3.94	3.60	86.28	0.76	2.26	2.88	0.28	4	13
Gray lime	24.16	6.17	3.23	88.98	0.90	0.13	.....	0.59	34	42
Dolomitic (Magnesian) Limes—										
Black lime	20.08	4.07	5.82	54.69	33.75	0.45	.....	.....	63	185
Cement lime	1.85	3.32	2.20	55.40	38.79	.....	.....	.....	29	70
Hydraulic lime	18.68	2.40	7.43	56.33	33.71	0.32	.....	.....	74	155
"Special" Limes (Cements)—										
A	16.32	24.07	6.33	57.10	0.22	1.00	9.63	1.65	380	1920
D (From same plant)	9.27	24.01	6.01	59.59	0.22	0.99	7.54	1.65	550	4300
G (From same plant)	9.55	29.28	2.65	61.25	1.04	1.16	1.42	0.20	550	5900

samples gave the following determinations which have not been previously published. A sample designated as "Red Lime" from Degerhamm, Sweden, showed the following composition:

	Per cent
Silica	24.05
Alumina and iron oxide	14.59
Lime	41.80
Magnesia	1.03
Sulphide	.47
Sulphurous anhydride	3.90
Loss on ignition	13.46
	99.30

With this material the following strengths were attained: In a 1 to 3 mixture with sand at 56 days, 46 kg. per sq. cm. (650 lb. per sq. in.) in compression. A mixture of 75% "Red Lime" and 25% silicious material, mixed with standard sand, 1 to 3, gave an average compressive strength of 103 kg. per sq. cm. (1460 lb. per sq. in.) in 28 days and 146 kg. (2071 lb.) in 56 days.

The silicious material used was one rich in soluble silica (soluble in hydrochloric acid) which enabled it to combine with the lime to form silicates.

Investigation of a strongly hydraulic lime from the Dornburg-Steudnitz Portland Cement and Lime Works resulted as follows:

	Per cent
Silica	23.10
Alumina and iron oxide	13.40
Lime	51.92
Magnesia	1.92
Sulphide	.44
Sulphurous anhydride	.63
Loss on ignition	8.28
	99.69

The compressive strength with a 1 to 3 mixture with standard sand was 54 kg. per sq. cm. in 7 days (770 lb. per sq. in.) and 80 kg. (1135 lb.) in 28 days. With an admixture of 25% of silicious material the compressive strength was 132 kg. (1890 lb.) in 7 days and 172 kg. (2430 lb.) in 28 days.

No Direct Relation Between Chemical Composition and Properties

It is apparent from the writer's and Burchartz's investigations that there is no direct connection between chemical composition and the hardening properties of the hydraulic lime; that, especially, the lime content is no criterion of the attainable strengths. Nor is there an explanation to be sought in the varying physical properties of the raw material such as density and crystalline structure. The variations in properties are rather due to the burning method, which in its turn is partly influenced by the physical structure. The hardening properties of a lime will increase or diminish according to how (after the expulsion of the carbon dioxide) the process of forming soluble silicates is carried on; the reaction between the solid substances, lime on the one hand and silica and alumina and iron oxides on the other hand.

Also the names used for the multitudes of materials offered on the European markets are no indication of their properties. Especially those designated as cement-limes represent nothing but hydraulic lime, either in their composition, method of production or physical and chemical properties. It is more or less deceptive if the impression is created that they possess qualities like those of portland cement. The case is similar with the special limes marketed under many different names and having as great a variation in properties. The classification and valuation of these latter is the more difficult since the manufacturers regard their processes as a business secret guarded with unnecessary caution.

The following definition which does not, however, include the special limes can be considered as definitely established: Natural hydraulic limes are products obtained by burning, at temperatures below sintering, limestones containing more or less clay and to which nothing has been added during or after burning. The lime content of the calcined product varies between 65% and 85%.

Lime in 1923

THE Department of Commerce announces that according to reports for the biennial census of manufacturers, 1923, the establishments engaged primarily in the manufacture of lime products in that year reported a total output valued at $47,243,756, an increase of 52.3% as compared with $31,015,487 in 1921, the last preceding census year. The total production for 1923 comprised 2,510,283 tons of quicklime valued at $25,693,305, 1,255,562 tons of hydrated lime valued at $13,851,455, 2,926,725 tons of limestone sold as such valued at $3,515,631 and miscellaneous products— crushed stone, ground limestone, flux, etc.—to the value of $4,183,365.

Of the 333 establishments reporting for 1923, 68 were located in Pennsylvania, 33 in Virginia, 24 in Wisconsin, 22 in Ohio, 18 in Missouri, 14 in New York, 13 in Tennessee, 11 in Alabama, 10 each in Maryland and Massachusetts, 9 each in California, Illinois, Indiana and Vermont and the remaining 74 in 24 other states.

The statistics for 1923 and 1921 are summarized in the following statement. The figures for 1923 are preliminary and subject to such correction as may be found necessary upon further examination.

	1923	1921	Per cent of increase
Number of establishments	333	292	14.0
Wage earners (average number)[1]	12,290	10,345	18.8
Maximum month	Aug. 13,341	Aug. 10,995	.....
Minimum month	Jan. 10,604	Jan. 9,168	.....
Per cent of maximum	79.5	83.4	.....
Wages	$13,522,069	$9,801,651	38.0
Cost of materials (including fuel and containers)	$19,700,191	$14,214,205	38.6
Products, total value	$47,243,756	$31,015,487	52.3
Lime:			
Quicklime—			
Tons	[2]2,510,283	[3]1,665,109	50.8
Value	25,693,305	$18,732,086	37.2
Hydrated lime—			
Tons	1,255,562	726,337	72.9
Value	$13,851,455	$7,489,707	84.9
Limestone, sold as such—			
Tons	2,926,725	2,425,372	20.7
Value	$3,515,631	$3,121,987	12.2
Other products—crushed stone, ground limestone, flux, etc.—value	$4,183,365	$1,661,707	151.8
Value added by manufacture[4]	$27,543,565	$16,801,282	63.9
Horsepower	74,263	(5)	.....
Coal consumed (tons of 2000 lb.)	965,210	(5)	.....

[1]Not including salaried officers and employees nor proprietors and firm members. Statistics for these classes will be given in final report.
[2]Includes 24,113 tons reported as agricultural lime.
[3]Includes 67,754 tons reported as agricultural lime.
[4]Value of products less cost of materials.
[5]Not reported.

Everett, Missouri, Farmers Win Car of Agricultural Limestone

THE members of the Cass county, Mo., farm bureau living in Everett township came to the annual meeting almost in a body. They had heard it rumored that some other township was going to try to beat them this year, so doubled their efforts and won for the second time. The total mileage, figuring one way, for this township was 618 miles. Raymore township was second in mileage, and Dolan was third. The farm bureau members in Everett townhsip who desire some of this lime will be given their proportionate share from the carload, provided they pay their share of the freight.

W. M. Spencer, Bethany Falls Limestone Co., is furnishing this lime. Mr. Spencer realizes this is a good thing for the farmers to get, and at the same time it is good advertising for his product. Almost one thousand tons of lime has been ordered in this county this year.—*Harrisonville (Mo.) Democrat.*

Mining and Quarrying Compared by an Engineer Familiar with Both Operations

Part 7—Typical Limestone Mining Operations

By J. R. Thoenen, Member A. I. M. E.

THIS is a continuation of a series of articles begun in the April 19, 1924, issue of ROCK PRODUCTS and based on extensive travels and inspections of limestone mining operations undertaken by the author as a special representative of this journal. The last previous article was published in the issue of October 4.

Plant (F)—Large Cement Operation

At this plant a 32-ft. stratum of limestone is mined by the room and pillar method; approximately 11 ft. of stone is left in the roof to carry overlying strata making the mineable thickness 21 ft.

In this mine a main haulageway is driven 14 ft. high and 30 ft. wide. On each side and parallel with it is driven a separate tunnel or shovelway 21 ft. high and 30 ft. wide. The pillars between the shovelways and main haulage tunnel are 50 ft. wide. From the shovelways rooms are driven at right angles 35 ft. wide and 21 ft. high with 35-ft. rib pillars between. Main haulageways are driven on 550-ft. centers.

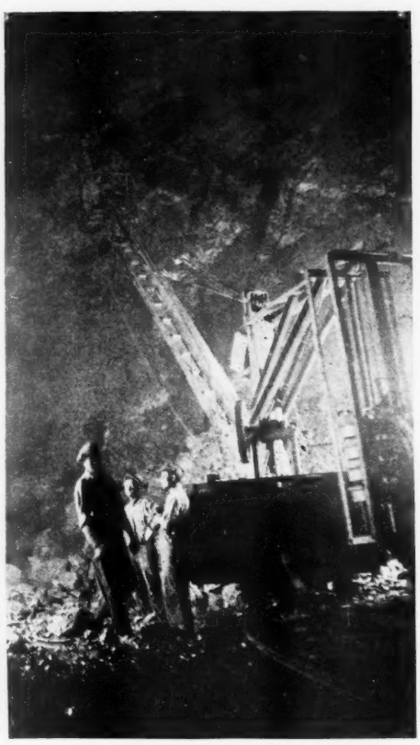
The use of a shovelway on each side of the main haulage tunnels is for the purpose of allowing headroom for the operation of standard traction type shovels using 1¼-yd. dippers. A special shovel using a ¾-yd. dipper is used in driving the main haulageways.

Two systems of breaking ground are used. One a combination of breast, back, and underhand or bench stoping and the other employing a breast stope carried at the top of the stone with underhand or bench stoping following. In the former a 7-ft. vertical breast is carried in the center of the stone and one round in advance of the upper and lower benches. If the reader will refer to Figs. 4 and 5 in the June 28 article and imagine both systems combined a clear picture of this method will be obtained. In the latter system the method illustrated by Fig. 4 is used.

In both systems the breast stopes are carried by the center or V-cut followed on each side by squaring up or rib holes. The breast in the first system requires from 18 to 24 holes 9 ft. long and the upper and lower benches 8 holes each 7 ft. in length. In the second system the breast is carried 10 ft. high with twenty-six 9-ft. holes and the bottom bench with eight 10-ft. holes. Bench holes are placed 6 ft. back from the face.

Air hammer type drills are used with blunt bull type bits. Water is used to remove cuttings and keep down the dust.

Blasting is done with 40% gelatin dynamite throughout.



Special drilling rig in Pennsylvania limestone mine

Cars are loaded by standard type steam shovels operated by compressed air at 90 lbs. pressure.

Mules are used to gather trains and 15-ton electric trolley type locomotives haul trains to the crushing plant.

In order to provide the necessary tonnage for the larger type shovels drills are operated two shifts while the shovels and locomotives operate one only.

Approximately two tons of rock are broken per pound of explosive.

One foot of hole drilled accounts for approximately one ton of rock.

At this plant each man underground produces 22½ tons of rock per day.

Plant (G)—Another Big Cement Operation

At this plant limestone is mined from a flat bed 500 ft. below the surface through a three compartment shaft. The stone mined is approximately 90 ft. thick and 10 ft. is left to carry the upper strata. Mining operations are confined to the upper half of the stratum, the lower half being left for future recovery.

The room and pillar system of mining is used with double entry similar to coal mine practice. Cross entries are 600 ft. apart and staggered.

Rooms are first carried 18 ft. wide and 30 ft. high. A 12-ft. heading or breast stope is carried at the top of the room one round in advance of a bench stope similar to Fig. 4 in the June 28 article. The bench holes do not break to the floor of the room and this lower bench or toe is taken up by horizontal holes or lifters. When the room has been advanced by this method for some distance it is widened by drilling holes in the sides from tripods. The stone broken from these side holes nearly fills the room and advantage is taken of this to set up the drill on top of the broken rock and take down the back with horizontal holes for another 12 ft. This is really a back stope on shrinkage. The completed room is then 30 ft. wide by 42 ft. high. To cut this room five distinct operations are employed viz. the original breast stope at the top of the narrow room, the bench or underhand stope, blasting the toe with lifters, widening the room with side holes, and the back stope.

Pillars are left 55 ft. square between rooms.

In the original breast stope a center or V-cut is used to break out the lower 8 ft. of the breast using 24 holes ranging from 6 to 8 ft. in depth. Three holes drilled from the same set up (one on each side and one drilled toward the center), bring down the upper 4 ft. Two drills are used in the heading. From the same set up eight bench holes are drilled 12 ft. deep. These holes are blasted by electric delay exploders.

After the broken rock from this breast

and bench has been cleared away drills are set up on the floor and take up the 6-ft. toe remaining by two rows of horizontal holes. In this manner the room is advanced some distance as a small room.

The next step is to widen the room. This is done by drilling the sides from tripods. Three 10-ft. holes are drilled fan wise, one pointed up, one slightly elevated, and one horizontal near the bottom of the room. All three are drilled at about 45 deg. with the long axis of the room. They carry 6 ft. of ground from each side of the room thus widening the room from 18 to 30 ft. As noted above this broken rock is left to afford scaffolding from which to take down the back.

By means of the back stope the room is increased in height from 30 to 42 ft. Three horizontal 12-ft. holes are drilled in vertical rows on each side of the room and one from each drill pointed toward the center.

Small air hammer type drills are used. All holes are drilled dry with hollow steel using a six point bit.

Explosive is 50% ammonia dynamite.

Cars are loaded by small electric shovels and small standard type, caterpillar traction shovels with ¾-yd. dipper.

Mules are used to gather loads and storage battery locomotives haul trains to shaft. Cars are hoisted up the shaft on a drop bottom cage and dumped at the surface without removing from the cage.

Approximately two tons of rock are broken per pound of explosive.

Approximately 1½ tons of rock are produced from each foot of hole drilled.

About 12 tons of rock are produced daily per man underground.

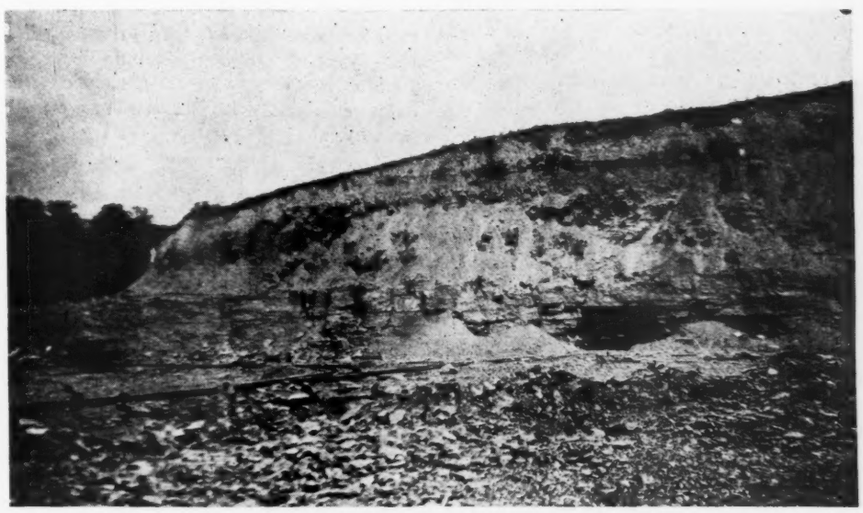
Plant (H)—Unique Drilling Methods

Plant (H) is a limestone mine operating on a stratum of stone 30 ft. thick and dipping at 12 deg. Directly on top of the limestone lies a 3-ft. shale bed which stands well for a short time after removal of the limestone.

The room and pillar method of mining is followed with rooms 22 ft. wide and pillars 35 ft. square.

The method of drilling holes at this mine is unique. A special car has been developed on which is mounted a mast and boom. The boom is swung by a rack and pinion by hand and elevated by a hand winch. On the upper end of the boom is mounted a cage large enough to accommodate two men. From this cage the whole face of the room is drilled. In this manner drilling can start immediately after blasting the round as the boom is long enough to reach over the broken rock and put the driller in touch with the face while the loaders can work below. The cage is also used to dislodge pieces of loose ground occurring on the back. (See cut on the preceding page.)

By the use of the boom and cage a bottom cut is drilled with no lifter holes. The first or cut holes are started about one-third the way up the face vertically and drilled at an angle of approximately sixty degrees from the horizontal and parallel with the long axis of the room. The next row is started a little higher at a slighter angle and so on until the top or back holes are reached which are nearly horizontal. Four horizontal rows of five holes are drilled to each round. Two men are used in the cage and they drill and shoot a round in 9 hours. Holes are drilled 10 ft. deep.



Mine entrances from old quarry floor

Small air hammer type drills are used unmounted with ⅞-in. hollow hexagon steel and bull bits.

Blasting is done with 40% gelatin dynamite.

Cars are loaded with small air-operated mechanical shovels gathered by mules and hauled by small steam locomotives.

Rooms are advanced 25 to 30 ft. and the broken rock cleaned out. The boom car is then backed up and long flat holes are drilled in the overlying shale. This is then shot down and removed. This operation would correspond somewhat to the stripping in the usual open quarry.

The dip of the bed presents a further problem in haulage. The original mine entry cut the limestone stratum near the top and was driven until the floor or footwall was encountered. To proceed on up the dip would obviously present difficulties in obtaining workable grades. This has been overcome by driving the haulageway at 45 deg. up the dip which cuts down the grade to a permissible percentage. Rooms are then carried as before at right angles to the dip and are therefore level in their long axis.

Plant (I)—Extension of Old Quarry Underground

At this mine a 21-ft. bed of limestone is mined leaving 3 ft. of good stone on the back to carry overlying shale. The stratum lies practically flat and is mined from the face of an old open pit. Mining was started because of the excessively increasing cost of removal of overburden. The good stone is capped by from 30 to 60 ft. of shale and loam. The shale must be drilled and blasted to be removed.

The room and pillar method of mining is used with 30-ft. rooms and 30-ft. pillars. Rooms are carried 18 ft. high.

Drilling is done by air hammer drills mounted on tripods. The method of placing holes is similar to that discussed under plant D in the October 4 number. Three holes in each vertical row carry the 18-ft. height.

A small caterpillar traction type electric shovel with ¾-yd. dipper will be used to load cars. At the present time cars are loaded by hand, the loaders using stone forks instead of shovels.

As this mine is in its initial stage costs and tonnage figures are omitted.

Plants (J), (K), (L)

These plants operate on limestone beds varying from 12 to 26 ft. in thickness, use the usual room and pillar system, and present no new problems not already discussed. Space will therefore not be taken to describe these operations in detail; but the reader is referred to previous installments of this series where the room and pillar system is discussed.

Gypsum Mining to Be Described

The mining of gypsum presents some problems similar to the mining of limestone and a short description of the methods employed may be of interest. I will therefore describe two or three gypsum mines where the problems presented are somewhat out of the ordinary, in a forthcoming issue.

(To be continued)

"Twenty Cent Sand" Condemned

RELIABLE information has been given ROCK PRODUCTS that the large pile of "20-cent sand," which had been pumped on the bank of the Missouri river near Kansas City has been condemned by the Missouri State Highway Commission.

Probably every reader of ROCK PRODUCTS knows about this "20-cent sand." If there is one who does not, it is not the fault of the press agent of the Missouri highway commission, who broadcasted all over the United States the information that the state of Missouri was able to buy sand suitable for making concrete highways at 20 cents a ton. Afterward Mr. Peipmeier, the Missouri highway engineer, revised the figures to 40 cents—with no allowance for a freight differential of 30 cents against the "20-cent sand," or for the cost of screening out sticks, lignite and oversize.

It is true that a number of carloads were shipped and this was presumably used in highway work. But further pumping brought up an even poorer grade of sand than that which was pumped at first, not only because it contained sticks and trash but because it was also too fine to pass the state's own specifications.

Evidence of this is to be found in the following analysis of a sample recently taken from the pile, made by a well-known testing laboratory. For easy comparison the grading is compared with the standard specification:

SCREEN ANALYSIS

Grading	Per cent
Passing 2 mesh	1.2
Passing 4 mesh	27.7
Passing 20 mesh	32.3
Passing 50 mesh	7.6
Passing 100 mesh	30.4
Passing 200 mesh	0.8
	100.0

SPECIFICATION REQUIREMENT

Sample	Pct.	Specification	Pct.
Passing ¼ inch screen	98.8	Not less than	95
Passing 20 mesh screen	71.1		30-70
Passing 50 mesh screen	38.8	Not more than	20
Passing 100 mesh screen	31.2	Not more than	5

Since the condemnation of the sand, the state highway commission has been buying the sand it needed from the regular producers of the district.

Ambrose Sand and Gravel Company Sold

THE Ambrose Sand and Gravel Co., owned and operated by Tim Murphy of Denison, Texas, opened for business a number of years ago, has been sold to D. M. Penn of Bonham and C. T. Aspelmier of Denison. The new owners intend to incorporate the company within a few weeks, it is said.

Mr. Penn is interested in the operation of the D. B. & N. O. railroad between Bonham and Bona. Mr. Aspelmier, the other member of the new firm, has been connected with the Katy transportation department for many years.

The new proprietors of the Ambrose Sand and Gravel Co. will specialize with washed sand for building purposes. This sand will be moved from the beds by hydraulic pressure that serves to wash the sand and load it at the same time.

The capacity of the company will be from 10 to 12 cars per day.—*Denison (Texas) Herald.*

Missouri Valley Association Meets December 16 and 17

THE Missouri Valley Association of Sand and Gravel Producers will hold its annual meeting in Kansas City, at the Muehlbach hotel, on December 16 and 17. W. E. Johnson is secretary of the association and its office address is 301 Minor building, Kansas City, Mo.

Sand Dredge Sunk in Mississippi by Collision

THE sand outfit of John Kirk of Caruthersville, opposite Dorena, on the Kentucky side of the Mississippi river, was sunk by a fleet of barges in tow by the Goltra steamer *Illinois* Saturday. It was sunk but no damage was sustained by the fleet.

The *Illinois* with her tow was bound for New Orleans with a cargo of 750,000 bu. of wheat. In making the turn at Hickman, a sharp one, the tow struck the sand outfit and it went to the bottom near Hickman.

It is stated that a fish dock and a part of the Mengel box factory's gravel outfit narrowly escaped damage.—*Record, New Madrid, Mo.*

Patents a "Gravel Cleaner"

SEVERAL patents have been granted recently to Cedar Rapids, Ia., inventors. Three have been granted to John Klepach, head of the Klepach Construction Co., for a gravel cleaner. With this contrivance it is possible to clean gravel anywhere.

It was invented especially for the purpose of getting the gravel in the best possible shape for the manufacture of Fluid Rocks, on which Mr. Klepach has patents pending. In addition to the Fluid Rocks, there are patents pending on the methods of constructing walls and foundations where these "rocks" are used.—*Cedar Rapids Gazette.*

Missouri "Chats"

"CHATS" is the name given to the refuse from the zinc-lead mines of the Missouri-Kansas-Oklahoma district. It is a flinty quartz crushed to ⅜-in. and finer, and it has a considerable influence on the market for fine stone and sand in the surrounding territory because so much of it is used there for concrete aggregate, road material and railroad ballast. It is estimated that shipments run from 1,500,000 to 2,000,000 tons annually.

Molding Sand Company Is Fifty Years Old

HALF a century of continuous operation and satisfactory service to the public is the proud record of the Humpich Sand Co. of Louisville, Ky., according to the statement of Matilda Humpich, manager of the concern. Covering a period of time mentioned, the Humpich company has been producing sand from pits at historic old "Fort Hill" and at other locations.

The Humpich company engages in the supplying of high-grade sands to foundries all over the country. Fifteen teams and large motor trucks constitute part of the equipment necessary for the carrying on of this business.

Many years ago Val Humpich started the company with only one team. Year after year it has made forward strides until today it spreads over an area of many acres.

Local and out-of-town contractors and foundries all over the United States are familiar with this sand and the service given by the company.

Back in 1891 Val Humpich turned the business over to his son, Ben Humpich. The latter died in 1923 and members of the family have carried on the business since that time.—*Louisville Courier-Journal.*

Moving Sand at Port Crescent with Large Conveying System

SAND boats are being loaded at Port Crescent, Mich., by the Port Crescent Sand and Fuel Co., using a $150,000 electric driven conveyor. Final construction work for the half million dollar sand project will be completed within a few days. The sand is for molding and grinding, and will be used by the Ford Motor Co. for molding, by the copper mining interests for refining copper and for grinding glass. The supply is virtually inexhaustible, engineers state. A 1600-ft. wharf was completed in the spring and a mile of fabric belting 30 in. in width, operated in nine units, carries the sand from the banks to the boats. A 29-ton gasoline caterpillar shovel deposits the supply on the first section, which carries it to the 14,000-ton storage pile. Tunnel conveyors lift the sand to the section which deposits it on the first wharf conveyor, where it is relayed by four sections to the boats. Boats are loaded at the rate of 500 tons an hour, with a possible increase to 600 tons an hour. The belt is troughed and runs over ball-bearing rollers. Ten electric motors with a total of more than 300 hp. are used to operate the outfit. Each of the nine sections is operated by a separate motor and works independently. The Central Power Co. of Bad Axe has extended a special line carrying 23,000 volts for operating the conveyor. More than 500,000 tons of sand will be shipped this season. The company will furnish steady employment for 12 to 20 men.

Editorial Comment

Stockholders in the American Commonwealth

A recent interview with a very prominent portland cement manufacturer gives rise to some interesting speculation. He has become a real student of our government—its origin, its constitution, its fundamentals. He keeps a copy of Alexander Hamilton's and James Madison's "Federalist" by him and is thoroughly familiar with it. He says he meets otherwise intelligent business executives who have never even heard of the "Federalist." Have *you,* now, honestly? Are you also in the class of those he says he has met who believe the constitution of the United States starts out with the preamble: "All men are created equal"?

If you are among the two classes mentioned let it be explained that the "Federalist" is a collection of essays or articles by Alexander Hamilton and James Madison explaining the operation of the proposed government and advocating the adoption of our federal constitution at a time when our national destiny hung in the balance. As the manufacturer referred to very well pointed out to the editor, every argument raised by present agitators for changes in our mode of government was ably answered by these two statemen and patriots nearly 140 years ago. The statement: "All men are created equal" is in the preface to Thomas Jefferson's Declaration of Independence—a document very skillfully written to promote and culminate revolutionary ideas in the minds of the masses; that is to unsettle them on the existing conditions. The purpose of the Declaration of Independence was therefore the exact opposite of that of the federal constitution.

There is a growing movement in this country to familiarize the ordinary man with our federal constitution. Big, broad-gage business men are helping. One of the largest lime manufacturing organizations in the country is offering its employes bound copies of the constitution for the asking. It is a good business move, as well as good patriotism. We are all stockholders in that gigantic business institution known as the Government of the United States. The day is gone by when that institution can be controlled by a comparatively few self-appointed directors. Its present and its future rest with the great body of stockholders—the common people, you and your organization included.

We are beginning to realize how much our business and your business depend upon the success with which our common business—the business of the government—is done. Consequently, ignorance of the very principles upon which that business is conducted is growing inexcusable, not merely in you but upon those who are more or less economically dependent upon you.

Merchandise As Well As Produce

We mistrust that many men have gone into the sand, gravel, crushed stone and slag industries because the manufacturing or producing end of the business looked comparatively simple; and the product made, being a basic material in constant demand, made marketing look hardly less complex. As a matter of fact, experience has shown many times over, that the successful marketing or merchandising of a staple, or a basic common material, is a most difficult problem. It is hard to find selling arguments; it is hard to distinguish your material from the other fellow's sufficiently to get your price. You can, and many do, stress the ability *to give service.*

Consequently, however the crushed stone, sand and gravel producers may look upon slag as a competing material, they can read with profit a story of how slag was successfully merchandised, notwithstanding their utmost opposition.

Three elements in the successful merchandising of this material are outlined by C. E. Ireland, of the Birmingham Slag Co. (1) Recognizing that the criticism of slag as first produced was well founded, they proceeded to make a slag that would meet objections to its use. (2) Having faith in the success of their product they submitted it to severe tests by unquestionable authorities, who subsequently testified to its worth (although, of course, it *might* have been otherwise). (3) Effective use of testimonial data in clever advertising.

Needless to say the same methods of merchandising apply equally well to sand, gravel or crushed stone. Do the best you can with the raw material. Know your product. Sell on quality.

Back Numbers of Rock Products

Many times in the course of a year Rock Products receives requests for back numbers two or three months old, and sometimes the request is prefaced by the remark, "I am sorry that copy got away from me." In many offices Rock Products is saved and filed as a matter of routine. It is looked upon as a current encyclopedia of the industries it covers and its files are consulted as any reference work would be, which is gratifying to the editors, as they try to make it that kind of a paper. Of course this office is glad to furnish back numbers when it can, but it usually happens that the much wanted copy is one for which there was such a demand that no extra copies are to be had. The moral would seem to be that the investment of a small allotment of office space and a moment's work to file the copy might pay dividends in needed information.

Portland Cement Used for Wall Plaster on "Ideal Home"

A FIRE might burn for an hour on the main floor of the Topeka, Kans., *Capital* Ideal Firesafe Home, when it is completed, without penetrating to the second floor, because walls and ceilings are being coated with portland cement fire resistant plaster. Since the average time required by the fire department to make a run is 12 minutes, and the longest time 20 minutes, this means that the sort of ceilings and walls used in the Ideal Home are a practical fire protection. In addition to its fire-resistant quality, the cement plaster and metal lath construction used is not damaged by water. Consequently firemen will enter a house having this sort of construction even when fire has reached an advanced stage and water has been turned into the building.

The ordinary building has wood lath and lime or gypsum plaster. In the Ideal Home No. A-1 metal lath is used and the plaster for the first or fireproof coating was made of one part portland cement, three parts sand, and hydrated lime equaling 10% of the amount of cement. For the finishing coat a white mixture of calcined gypsum and lime is being used. It costs 25 cents per square yard more to put on the sort of plaster used in the Ideal Home than it does for ordinary plastering, according to J. A. Hartzell, who is doing the job.—*Topeka (Kans.) Capital.*

Cement Company's "No Accident" Campaign

"NO Accidents During November" is the slogan of a campaign launched at a meeting of the employes of the Glens Falls Portland Cement Co. The drive to eliminate all accidents is a special campaign for one month in the company's "safety first" work which is conducted the year around under the direction of Frank Sansouci, director of safety at the plant, according to New York papers.

The meeting was addressed by Frank P. Monaghan, superintendent of the plant; H. W. Gabor, chief safety engineer of the New York state insurance fund, and P. F. Connolly, safety organizer for the state fund. The three men told of the necessity for exercising the utmost care to prevent accidents and gave the employes good advice on accident prevention.

The "safety first" organization at the cement works ranks high among similar organizations in the industrial plants throughout the state, and the company and men take a justifiable pride in this splendid record. Accidents have been reduced to the minimum. Of course, in a plant employing hundreds of men there will be some accidents, but progressive concerns like the Glens Falls Portland Cement Co., which have the welfare of their employes in mind, are striving to keep the number of accidents at the lowest possible figure, and a remarkable success has been achieved at the cement works, where this modern feature of industrial operation is so thoroughly conducted by President Bayle, Superintendent Monaghan and Safety Director Sansouci.

Cement Company Will Pay $25 for a Suitable Name

ANNOUNCEMENT of the location near Tulsa, Okla., of a cement plant was made recently coincident with the offer of a prize of $25 for a suitable name for the company which will prominently identify Tulsa with the concern. Men prominent in the Tulsa world of finance and capital are said to be behind the new venture which has now passed the experimental stage.

Behind the decision to stage such a contest there lies quite an interesting story. The stockholders in the new institution decided that they want to call it "The Tulsa Portland Cement Co.," but when they filed articles of incorporation under that name it was turned down by the secretary of state because this name already was on record and it would cause too much confusion in state and corporation commission records.

Back in 1908 there was a cement company organized here and it was incorporated under the name of the Tulsa Portland Cement Co., but it was short-lived. Then again in 1911 another Tulsa Portland Cement Co. was organized and according to the files in the office of the secretary of state it is still operating. Even in 1907 a company of that name was incorporated, but its charter was canceled on June 10, 1919. Since the filing of the above company the attorney-general has ruled against the acceptance of names so similar as to cause confusion in the files.

So the new company is up against it for a name and has adopted this unique way to secure one. Send in any suggested name except the one turned down by the secretary of state but get as near to it as possible.

The plant which the company plans to build here will have a daily capacity of from 2000 to 2500 bbl. of portland cement daily. The location will be within the yard limits of Tulsa on one of the several sites that are being investigated in the vicinity of Dawson. The company has acquired 320 acres of limestone land underlaid with shale. Fuel and power has been arranged for. It is said that there is ample capital to make the proposition a reality.

Just as soon as the name has been selected the company will be incorporated for $1,500,000. Work on the plant will be commenced within 30 days, it is said.—*Tulsa (Okla.) World.*

To Make Portland Cement from Beds of Fossil Shells

SIXTY million barrels of portland cement can be produced, on a basis of 2000 bbl. a day during a six-day working week and a 50-week year, from 1140 acres of compact beds of fossil shells in Imperial county during a period of 100 years, according to engineers for the American Portland Cement Co. of Los Angeles.

The remarkable deposits on the property of the company consist of beds of fossil shells. The beds lie in successive layers and are generally found one above the other, varying from 2 to 30 ft. in thickness and having between these layers a strata of clay of about equal depth.

After extended examination of the deposits by engineers for the company, officials of the latter have stated that the available tonnage of shell, from which the firm plans to manufacture a high grade of portland cement, is in excess of 15,000,000 tons and that this estimate includes only the tonnage which is either visible to the eye or clearly indicated.

The American Portland Cement Co. was organized a little less than a year ago and has an authorized capital of $3,000,000. It is the plan of the company, it is said, to erect a cement manufacturing plant upon the property it controls. The latter will cost about $750,000 and will represent the first unit of a three-unit plant with a daily capacity for manufacturing about 3000 bbl. of cement.—*Los Angeles Herald.*

Missouri Compensation Defeated

THE latest returns indicate that the proposed workmen's compensation bill for Missouri was defeated by a majority of nearly 100,000. This bill was one of the most radical ever offered for the public to vote on. The vote speaks for itself. Employers' organizations and the Associated Industries of Missouri in particular waged fight against the measure, which was introduced by the Missouri Federation of Labor. The bill proposed in case of temporary total disability maximum compensation of $30 a week. This is far in excess of the schedules for contiguous states. For instance, the Iowa law grants a maximum of $15 a week with a maximum total of $4500. The maximum in the proposed Missouri bill was $12,000.

For permanent total disability, Illinois grants a workman without family a total of $3750 in installments up to $14 a week, and thereafter a life pension, maximum $300, minimum $120. The proposed Missouri bill if passed would have granted a maximum of $30 a week for life.

Probably a more equitable bill will be presented to the Missouri legislature at the next session in January.—*American Contractor.*

Pioneer Michigan Cement Maker Passes Away

JOHN MONAGHAN, one of the oldest business men in Michigan, died at Alpena, Mich., last week, aged 91. He was born in Ireland, came to Detroit in 1856, was a marine grocer; became a jobber and lumberman in Alpena in 1885, and was the founder of the Alpena Portland Cement Co. Mr. Monaghan was a self-schooled man, read into physical science very deeply, and was a student of nature as well as of books. He delighted to ramble through the wild country about Alpena, and it was while on these explorations that he became familiar with the immense deposits of marl and limestone surrounding, which later were to make possible the establishment of the cement industry.

He commenced the series of experiments in a room over his grocery store which resulted in the discovery that he could make portland cement, and that millions of tons of its raw materials lay close to Alpena.

For weeks he labored in the room over the store, using an old coal stove as a kiln, but, try as he might, he could not produce sufficient heat for the purpose. Finally he obtained use of the forge at a blacksmith shop. It was there that the first portland cement made in Alpena was produced.

Then steps were taken for the organization of the Alpena Portland Cement Co., of which Mr. Monaghan was the first president. He also served as sales manager and secretary of the company until the year 1907.

In 1907 Mr. Monaghan became the active head of the Alpena Coal Co., with which he severed connections and retired from active business life in 1915.

A. B. Sanger Joins Staff of G. M. Basford Company

THE G. M. Basford Co., industrial and technical advertising counselor, New York City, has announced that Alan B. Sanger will have charge of its department covering advertising of industrial machinery and material handling equipment.

Mr. Sanger is a graduate of the Massachusetts Institute of Technology, and is a mining and metallurgical engineer, with several years' practical experience in the mines, mills and smelters. He was formerly a member of the advertising staff of ROCK PRODUCTS, which he represented in the East for two and one-half years. His name is familiar to ROCK PRODUCTS readers for his contributions to this paper, especially those relating to the slate industry.

Mr. Sanger's practical engineering work plus his advertising and sales experience qualifies him to act as advertising counselor to manufacturers of industrial machinery and material handling equipment. His former associates have every wish for his success in this work.

Louisville Cement Company's Vice-President Is Elected U. S. Senator

FRED M. SACKETT, business associate of Wm. S. Speed, Louisville, Ky., and vice-president of the Louisville Cement Co., was winner by a 20,000 majority in the recent election for United States senator. He is a Republican.

Mr. Sackett has served three terms as president of the Louisville Board of Trade, from which he resigned during the war when he became a "dollar a year man" as

Fred M. Sackett, newly elected U. S. Senator

Federal Food Administrator for Kentucky. He was also instrumental in bringing Camp Taylor to Louisville, arranging for lease and purchase of land at his own risk. He was a member of the State Board of Charities and Correctors, during the period in which Governor Morrow was in office.

Mr. Sackett, previous to his present time, has never run for any public office, and when his name was suggested, merely remarked that he would not refuse the nomination if it was offered him, as he desired to aid his state and the South in any way possible.

Rumored Red Star Cement Company Will Build New Plant

NUMEROUS newspaper dispatches say that the Red Star Cement Co. of La Salle, Ill., is shortly to begin the building of a $2,000,000 plant for making portland cement. A Chicago Heights paper says that William Gillman of Chicago Heights has just been elected a director of the company

New Cement Silos at Glens Falls Cement Plant

CONSTRUCTION of six large cement silo warehouses which will cost at least $200,000 has been started at the Glens Falls Portland Cement Co.'s plant by employes of MacDonald Brothers of Chicago, who have been awarded the contract.

Each structure will be 40 ft. in diameter and 60 ft. high and the capacity of the six will be 115,000 bbl. They will be built of concrete, adjoining the present store house and in the rear of the new office building.

The excavation is now in progress and it is expected the buildings will be completed by spring.

Additional storage space has been made necessary by doubling the capacity of the plant. Under the direction of George F. Bayle, Sr., president, and his associates in the company, the business has had such a remarkable development that it was necessary to double the capacity of the plant to meet the demand for the company's product.—*Glens Falls (N. Y.) Post-Star.*

New Gypsum Tile Board

"SHEETROCK TILE BOARD" is a new development of Sheetrock fireproof wallboard announced by the United States Gypsum Co. It consists of slabs of gypsum wallboard, ⅜ in. thick, 4 ft. wide, and 6, 7, 8, 9, or 10 ft. long. It is impressed to represent ceramic tile of the standard size, 2½x5 in., and is to be finished with enamel. It is designed for wainscoting or entire walls in kitchens, bathrooms, lavatories, and laundries in dwelling houses or for other places such as dairies, doctors' and dentists' offices, restaurants and barber shops.

Sheetrock tile board is nailed horizontally to the studding or over the old wall. The various lengths make it possible in most cases to fit the space with one board so that the joints are made in the corners; in other cases, the joints as well as the nailheads, may be effaced with "Sheetrock finisher." The tile board surface then is primed with a mixture of equal parts of a good varnish size and flat paint of a color similar to that desired in the completed job. When this is dried, it is smoothed down with sandpaper. Then two coats of flat paint of the desired color are applied and, when they have dried, the surface is enameled.

The cost is very low and, because it is a large-unit material, the board is economical in application. It produces a washable, sanitary, permanent surface. Because it is made of gypsum rock, it will not warp, bulge or crack. It is fire-resistive and an insulator. It is suggested as especially valuable in communities in which mechanics skilled in tile setting are not to be found. It possesses all the qualities of the standard Sheetrock wallboard, including the square, fibre-bound edges.

British Cement Industry Reorganized

THE reconstruction of the Board of the Associated Portland Cement Manufacturers, Ltd., has now been carried out.

The following directors have resigned: Brigadier-General the Hon. F. C. Stanley (chairman), Mr. Anthony White, Mr. Walter F. Loch, Mr. Alfred Brooks and Mr. Henry Holt, and, at a meeting, recently the following were elected: Mr. W. J. Firth, Sir James Allan Horne, Lord Meston and Mr. P. J. Pybus.

Mr. P. M. Stewart, who has hitherto been a vice-chairman, has been elected chairman.

The changes in the direction of this great organization, which controls $13,000,000 of capital and nearly 90% of the industry, are the sequel to the sensational coup carried out by Mr. Henry S. Horne, partner in the stock broking firm of Read & Brigstoke. Mr. Horne bought the shares of the company so skilfully in the open market that the old board had no knowledge of the capture of their supremacy.

With the new members previously elected to the board, Sir Philip Nash and Brigadier-General A. C. Critchley, the company will now have as strong a directorate as it is possible to conceive for a trading concern of this magnitude, and the reorganization of the industry to meet modern conditions may now be expected.—*The Stone Trades Journal (England).*

Hardening of Portland Cement Due to Solid Solution

PREVIOUS observers working with a large excess of water have noticed during the setting of cement the formation of needles of a calcium silicate, then hexagonal plates of calcium aluminate, and finally the disappearance of the crystals with formation of a gel. In the hydration of clinker the hexagonal plates appear first, then the gel and crystals of calcium hydroxide. The hexagonal plates were made synthetically by melting together 3CaO and Al_2O_3 and treating with H_2O. The crystals proved to be $3CaO.Al_2O_3.7H_2O$. The needles were also synthesized by making the tricalcium silicate by melting together $CaCO_3$ and SiO_2 and treating with H_2O. They can also be prepared by treating a 5% SiO_2 sol with $Ca(OH)_2$ solution, warming on the water bath and letting stand for a week. On prolonged standing both types of crystals decompose again to form a gel. When the amount of H_2O added to the cement is cut down more nearly to the proportion used in practice by employing mixtures of glycerol and H_2O in place of H_2O alone for making the microscope slides it is found that the setting of the cement takes place without the formation of the needles, the reaction proceeding at once to the gel stage. It is, therefore, concluded that the hardening of cement is due to the formation of the gel rather than to the interlocking of the needle-like crystals.

The above is an abstract by F. L. Browne of an article by Hans Pulfrich and G. Linck in the *Kolloid-Zeitung* (German). It would seem to indicate that the setting of portland cement is finally due to solid solutions which are formed at ordinary temperatures and in the presence of water, thus differing from the slags and alloys of metallurgy which are formed dry and only at high temperatures.

How Group Insurance Worked in One Cement Plant

ALL the employes of the Dewey Portland Cement Co. are insured for $1000, due and payable to the beneficiary at the time of the policy holder's death. To let the employes understand how soon after death the beneficiary receives the value of the policy the following item is of interest: On Tuesday night, October 21, at 11 o'clock Marion Anderson, an employe of the company, died from a stroke of apoplexy and on Wednesday morning a proof of the death was sent from the Dewey office to the insurance company in Oklahoma City, and on Saturday morning, October 25, the $1000 payable to the wife of the deceased was at the office of the Dewey company for her acceptance.—*Enterprise, Bartlesville, Okla.*

Guide to Good Stucco

THE Atlas Portland Cement Co. has issued a handsome publication called "A Guide to Good Stucco," which is explained by the title. The reproduced photographs of the various stucco finishes and their application are exceptionally good, especially to one who understands the difficulty of catching the effect of such material by photography. Several good color plates show the effect of colored aggregate in stucco. This book will interest ROCK PRODUCTS readers who have an excess of fine and medium sized aggregate to dispose of, as portland cement stucco is one of the outlets for such excess. It is issued from the New York office, 25 Broadway, of the Atlas Portland Cement Co.

Asphalt and Oil Sands

BITUMINOUS Sands of Northern Alberta is a pamphlet issued by the Canadian Department of Mines and published by F. C. Acland, Ottawa, Ont. A part of the book is devoted to the deposits spoken of in the title, but what may be of more interest to the general reader is a very complete summary of the attempts that have been made to extract asphalt and mineral oils from various oil bearing sandstones and shales. The application of rock asphalt to paving is also considered.

To Build Cement Plant at Davenport, Iowa

THE Linwood Cement Co., Davenport, Iowa, is proceeding with plans for the construction of a wet process cement plant with a capacity of a million barrels of portland cement annually, John F. Schroeder, secretary of the company, has just announced. The plant will be seven miles west of Davenport on the newly paved highway and will have excellent shipping facilities. The Linwood company, it is said, will build a wet-process cement plant from which steam power for operating the plant will be secured from waste heat, similar to the Petoskey Portland Cement Co. plant. J. C. Buckbee of J. C. Buckbee Co., engineers, Chicago, spent several days in Davenport recently going over the ground. The Linwood company is a $2,000,000 organization. It has operated a quarry and crushing plant for a number of years.

Oil Shale Cement and Fuel for Lime Burning

THIS subject was treated by Dr. Antropoff (Zeit. fur Ange iv. Ch.), who after describing the geographic and geological situation of some oriental shales, deals with their utilization to produce oil, for heating, gas manufacture and burning lime and cement.

Shale, when burnt, is particularly useful for portland cement, as the clinker has the composition of marl. Pulverized, it readily ignites and can thus be used for rotary kilns.

It is to be noted that the shale deposits are near those of brown clay employed for cement. In one works the shale is used to fire boilers and rotary kilns.

The shale is crushed in tube mills, sifted and then blown into the kilns. This has given excellent results and made coal unnecessary.

Combustible shale is also suitable for lime burning.—*Revue des Materiaux de Construction.*

Cebu Portland Cement Company Begins Exporting Cement

WITH an initial shipment of 600 tons, the Cebu Portland Cement Co., has begun to extend its field beyond Philippine territory and to seek broader markets for its products in the United States and other foreign countries. This first shipment left Cebu last week direct for San Francisco.

It is believed that from now on the company will be able not only to meet foreign competition in the local market, but also abroad, in view of new facilities recently added to the plant in Cebu. It is expected that its shipments to the United States will be gradually increased, especially if not too great difficulties are met by the company in marketing its products there.—*Manila (P. I.) Bulletin.*

H. W. Sheffer Succeeds E. L. Morris at American Lime and Stone Company

E. L. "BUD" MORRIS has resigned his position as general superintendent with the American Lime and Stone Co. and will shortly leave for the South where he has accepted the position of vice-president and general manager of the A. G. Morris Stone Co., Macon, Ga., owned by his father, Charles A. Morris. "Bud," as he was known by his friends, was very well liked by his associates and will be missed, says a Bellefonte, Penn., news item.

H. W. Sheffer, who has for the past 18 months been superintendent of the Union Furnace plants, has been transferred to Bellefonte and will assume the duties of general plants superintendent.

Prior to coming with the American company Mr. Sheffer managed quarries for Winston & Co., New York and Richmond, Va. "Herb" was brought up in the Bellefonte quarries and his father was also a quarryman. For six years he was superintendent of the Cambria Steel Co. quarries at Naginey, Penn.

Slag Scale Prescribed

THE Interstate Commerce Commission, in a report written by Chairman Hall, on No. 13662, Duquesne Slag Products Co. et al. vs. Pennsylvania, et al., mimeographed, has prescribed a scale to be used in making rates on crushed slag from producing points in eastern Pennsylvania to destinations in New York, New Jersey, Delaware, Maryland, Virginia and the District of Columbia. The rates are to be established not later than December 29. The Commission found the rates unreasonable and unduly prejudicial. The report also covers No. 14204, John M. Buckland, trading as National Slag Co. vs. Atlantic City Railway et al.

The points of origin in the leading complaint are Birdsboro, Pottstown and Swedeland; in No. 14204, Bethlehem, Hokendaqua, Emaus and Lebanon, Pa. The destinations in the leading complaint are in New Jersey, Delaware, Maryland, and Virginia on the Pennsylvania lines; in No. 14204, in New York, New Jersey, Delaware, Maryland, Pennsylvania, and the District of Columbia on the lines of the Pennsylvania, the Reading, the Baltimore & Ohio and their subsidiaries.

Chairman Hall said inconsistency in the rates covering slag was marked particularly in those from the plants of the National Slag Co. It said that in some instances the rates from those plants were on the same basis as from the Duquesne plants at Pottstown and Birdsboro and in others as low as, or lower than, the rates under the Birdsboro scale. The Birdsboro scale was found reasonable on application on slag from the plants of the Duquesne producers. The application of sixth class rates on slag moving in competition with slag under commodity rates, he said, was indefensible, and defendants, he said, did not attempt to justify it. The finding was that the rates on slag from Lebanon, Emaus, Hokendauqua and Bethlehem for distances not in excess of 220 miles, distances to be computed over short-line routes, whether composed of one or more carriers, are, and for the future would be, unreasonable to the extent they exceed or may exceed rates made in accordance with the following scale:

Miles	*(cts.)	‡(cts.)
31- 40	80	100
41- 50	85	105
51- 60	90	110
61- 70	105	125
71- 80	115	135
81- 90	125	145
91-100	125	145
101-110	140	160
111-120	140	160
121-130	150	170
131-140	160	180
141-150	160	180
151-160	160	180
161-170	175	195
171-180	175	195
181-190	185	205
191-200	185	205
201-210	185	205
211-220	185	205

Rates per net ton. The (*) refers to one line of railroad, or two or more lines of railroad under the same management and control; and (‡) to two or more lines of railroad not under the same management and control.—*Traffic World.*

One Plant of Duquesne Slag Company Damaged by Fire

THE large crusher plant of the Duquesne Slag Products Co., located at the slag bank of the Temple Furnace, Penn., was damaged by a fire recently. The loss is estimated at over $15,000. The quick response of the local fire company saved the adjoining buildings.

The machinery in the crusher building was operated by electricity, and the motors and other parts were completely destroyed.

The company operating the plant is a Pittsburgh concern and was located at this place for more than a year. The slag was taken from the cinder bank of the Temple Furnace Co., and the products were shipped to various points in the East. There were 18 men employed at the plant.—*Reading Eagle.*

New Tramline of the Superior Portland Cement Company

ANNOUNCEMENT was made by the Superior Portland Cement Co. recently that bids would be received for the construction of 14 towers for an aerial tramline between the quarry and the factory of that company at Concrete.

The tramline is being constructed for use in carrying lime rock from the quarry and will be the largest structure of its kind in the Pacific Northwest. Alternate bids will be received on reinforced concrete and structural steel towers. Estimated cost of the entire conveying system is around $200,000. The tramline will be 6,730 ft. long. There is a drop between the upper and lower terminals of 215 ft. The 88 steel buckets, each 30 cu. ft. capacity, will travel at the rate of 450 ft. per minute, carrying 200 tons of crushed lime rock per hour. A bucketful of lime rock will be dumped every 24½ seconds. All details of construction are being handled by Plant Superintendent C. L. Wagner of Concrete, Wash.—*Seattle Journal of Commerce.*

United States Gypsum Company Prosperous

DIRECTORS of the United States Gypsum Co. recently declared a common stock dividend of 35%, thus more than fulfilling stock market expectations. It will be payable December 31 to common stockholders of record December 5.

An extra cash dividend of $5 a share, or 25% on the $20 par stock, also was declared on the common stock, payable December 31 to holders of record December 5. The regular quarterly dividend of $1.75 a share was declared on the preferred stock.

The quarterly cash dividend rate on the common stock was increased from 1%, or 20 cents a share, to 2%, or 40 cents, a share. The first dividend at the increased rate will be paid December 31 to stockholders of record December 5, and the same rate will be maintained after the distribution of the stock dividend.

The 35% stock dividend will increase the outstanding common stock from $5,911,680 to $7,980,768.

United States Gypsum stock, in response to large earnings and melon expectations, has risen in the last few months from below 90 to 140, today's (Nov. 12) high record price.

A year ago a stock dividend of 20% was paid. Earnings this year have been estimated unofficially in excess of $20 a share on the common stock.—*Chicago Daily News.*

Crushing Plant Robbed of Part of Its Pay Roll

THREE young men recently held up and robbed the American Rock Crusher Co., 3700 Rainbow boulevard, Kansas City, Kans., of $322.50, part of the payroll, and escaped in a motor car.

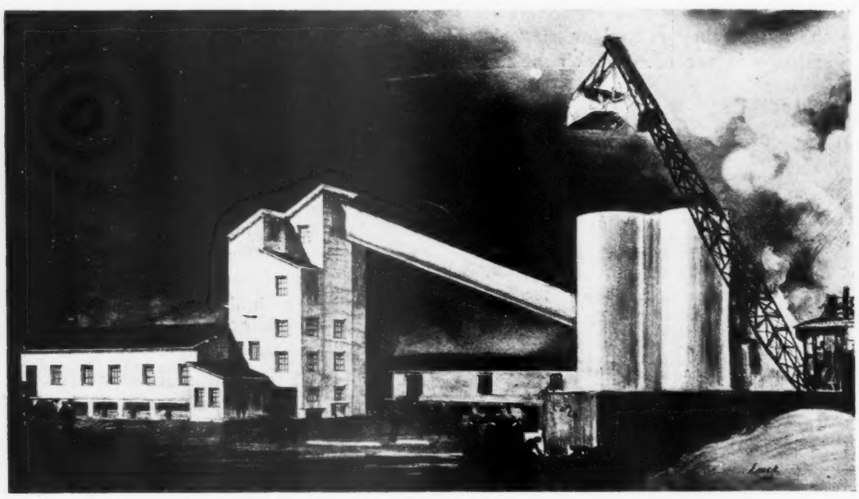
The robbers entered the building where J. B. Boyle, one of the owners of the company, was paying off the men. The thieves took $300 from Boyle and $22.50 from James Drew, one of the employes, who had just received his salary.

In the hurry to escape, the robbers overlooked another payroll in the building that amounted to several thousand dollars.—*Kansas City (Kans.) Kansan.*

Stewart Sand Company Builds Mixed Mortar Plant

CONSTRUCTION was begun recently on a new plant for the Stewart Sand Co. of Kansas City, Mo., which will introduce a new departure in the local building field.

The plant will produce ready mixed brick mortar, plaster and finishing putty that can be delivered wet to the consumer and save the necessity of preparing those materials on the building sites. Specially built trucks will be provided for delivery.



Architects' drawing of new mixed mortar plant of Stewart Sand Co.

The plant is being built on the site of one of the company's sand plants at the foot of Grand avenue. The products will be distributed under the Blue Diamond trade name. The company has obtained the right to produce products under the brand in this territory.

The product is mixed by the Hay patented process. The sand will come from reinforced concrete tanks served by electrically operated locomotive cranes and conveyed to the main plant near by. After being screened the sand will be deposited in an overhead tank to be used as needed. The lime and other materials will be stored in a warehouse.

In manufacturing the product the company will slake high grade lime which has been screened to remove all foreign materials. After aging in large vats it is agitated or whipped before going to the measuring tanks to be mixed with other materials. Finishing putty will be aged separately in large wooden vats.

Steel and reinforced concrete are being used in construction of the plant. It will have a capacity to supply a considerable proportion of the plaster and mortar requirements of Kansas City and will be built so additions may be added in the future.

Plants employing this process are already in operation in Los Angeles, San Francisco, Cleveland, Boston, Philadelphia, Atlanta and Fort Worth, and have been found to effect a considerable saving to the home owner as well as securing a better product.

According to John Prince, president of the company, as quoted in a Kansas City paper, this process of preparing mixed building materials was begun in Los Angeles nine years ago.

"Until this process was begun on the west coast," Mr. Prince said, "the art of producing high grade lime mortar and plaster was being lost on account of the inability of the contractor to age the products properly on the job and obtain the accurate combinations necessary.

"In Europe when ancient buildings we now admire were under construction, lime was slaked months in advance of its use. Slaves of 2000 years ago thoroughly beat the lime with flails before it was used."

Montana Farmers Testing Fields with Gypsum

PLANS are being made for extensive experiments the coming year to determine the value of gypsum as a commercial fertilizer for forage crops in the area tributary to Whitefish, Mont.

While few parts of Montana, at the present time, have better forage crops than here, experiments in Sanders county and elsewhere have proved that by the use of gypsum production can be increased from 75 to 100%. Conditions here being similar to those found in the neighboring county, is is believed a wise plan to experiment with the country around Whitefish, where it is probable that a great increase in production will result, especially in clover and alfalfa, which are the most important of the forage crops.

The gypsum will cost about 65 cents an acre and is simply sprinkled over the land, making the cost of application virtually nothing. Present plans are laid out by the county extension service to introduce the gypsum through the local chamber of commerce to some of the farms around Whitefish.—*Helena Record-Herald.*

Gypsum Company May Build Lime Plant in Illinois

PLANS of the United States Gypsum Co. for construction of a quarter-million dollar lime plant on a tract of land between Cordova and Port Byron are nearing completion, according to reports received in Moline recently. It is understood that options have been secured on two pieces of property comprising some 50 acres of what is declared to be one of the richest lime beds west of Ohio.

The United States Gypsum Co., with central offices in Chicago, is one of the largest organizations of its kind in the country and for some time has been desirous, it is said, of getting control of a lime bed in this section from which material could be furnished for operations in the central territory.

Engineers of the company are said to have been in the field for several days making an analysis of the deposits found in the Cordova tract. Reports from this investigation indicate, according to reliable information, that the particular property on which options have been secured shows a 43% CaO rock deposit.

Construction of a battery of six or more kilns is said to be under consideration and it is believed work on them will be started in the immediate future so that the company will be in a position to handle early spring demands.—*Moline (Ill.) Dispatch.*

Buried in a Gravel Slide

JOHN DOLL is said to be in a critical condition, suffering from the effects of being covered over by gravel while working at the Progress loading shed in Webb City, Mo.

Doll's injuries are about his lungs and chest. He was covered under 7 ft. of gravel for nearly two hours before volunteers were able to rescue him. His lungs are believed permanently injured because of breathing dust from the gravel while covered up.

Doll is said to have been repairing a loading device under a cliff of gravel when a a gravel slide caught him.—*Joplin (Mo.) Globe.*

Vanadium in Phosphate Rock

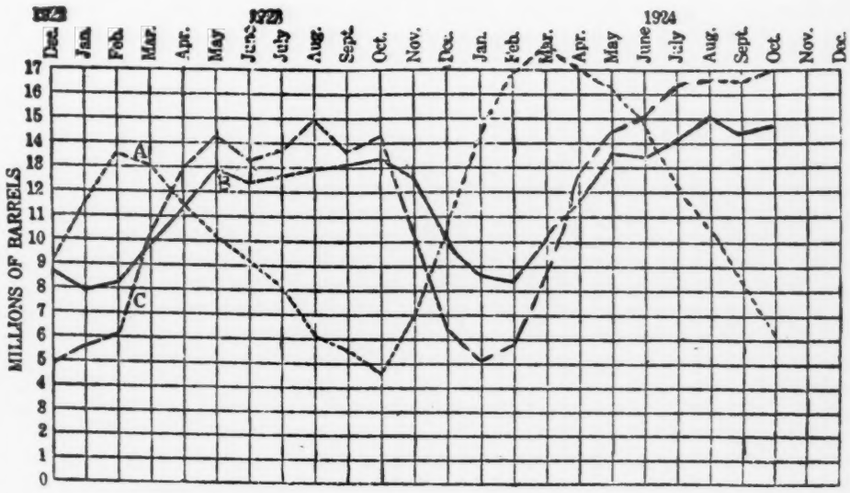
A WRITER in the current *Engineering and Mining Journal-Press* states that the phosphate rock of the Idaho, Montana, Utah and Wyoming deposits contains vanadium, which is a high priced metal used in making vanadium steel, as a dye mordant and for other important industrial purposes. This may possibly be removed economically, as it goes into solution when the rock is dissolved in the making of phosphoric acid, although there are some technical difficulties in the way of its recovery. The vanadium content of the rock is low, samples showing from 0.11 to 0.52% vanadium oxide (V_2O_5).

Portland Cement Statistics for October

THE following tables, prepared under the direction of Ernest F. Burchard, of the Geological Survey, are based mainly on the reports of producers of portland cement but in part on estimates. The estimates for October, 1924, were made necessary by the lack of returns from three plants. Production and shipments were nearly at the same rate as in September; shipments reached a new high level. Stocks decreased considerably but are 33% higher than in October, 1923. Total production to November 1 was 125,283,000; total shipments, 129,873,000 bbl.

Stocks of clinker, or unground cement, at the mills at the end of October, 1924, amounted to about 3,650,000 bbl. compared with 4,260,000 bbl. (revised) at the beginning of the month.

The following figures show shipments from portland cement mills distributed among the states to which cement was shipped during July and August, 1924. It is planned to publish in succeeding issues of this report similar figures for succeeding months and also for the preceding months back to October, 1923, when these figures are available:



(A) Stocks of finished portland cement at factories. (B) Production of finished portland cement. (C) Shipments of finished portland cement from factories

The Bureau of Foreign and Domestic Commerce, of the Department of Commerce, reports that the imports of hydraulic cement in September, 1924, amounted to 134,245 bbl., valued at $226,227. The total imports in 1923 amounted to 1,678,636 bbl., valued at $2,964,098.

The imports in September were from Norway, 47,022 bbl.; Belgium, 40,832 bbl.; Denmark, 29,954 bbl.; Canada, 14,310 bbl.; Germany, 1555 bbl.; France, 447 bbl.; Japan, 119 bbl.; Spain, 6 bbl.

The imports were received in the following districts: Porto Rico, 32,981 bbl.; Hawaii, 29,251 bbl.; Washington, 15,960 bbl.; Los Angeles, 10,778 bbl.; Massachusetts, 9208 bbl.; New Orleans, 7506 bbl.; Vermont, 6863 bbl.; San Francisco, 5755 bbl.; Oregon, 5076 bbl.; Buffalo, 4164 bbl.; New York, 3587 bbl.; other districts, 3116 bbl.

The exports of hydraulic cement in September, 1924, were 69,470 bbl., valued at $206,921, of which there was sent to Cuba 36,071 bbl.; to the other West Indies, 2995 bbl.; South America, 15,658 bbl.; Mexico, 8954 bbl.; Central America, 2687 bbl.; Canada, 512 bbl.; and to other countries, 2593 bbl. These exports are exclusive of

PRODUCTION, SHIPMENTS AND STOCKS OF FINISHED PORTLAND CEMENT, BY DISTRICTS, IN OCTOBER, 1923 AND 1924, AND STOCKS IN SEPTEMBER, 1924, IN BARRELS

Commercial district	Production—October		Shipments—October		Stocks at end of October		Stocks at end of September,
	1923	1924	1923	1924	1923	1924	1924*
Eastern Pa., N. J. & Md.	3,342,000	3,598,000	3,922,000	4,219,000	1,075,000	752,000	1,373,000
New York	731,000	809,000	864,000	983,000	381,000	379,000	553,000
Ohio, W'n Pa. & W. Va.	1,266,000	1,495,000	1,412,000	1,919,000	159,000	471,000	895,000
Michigan	925,000	1,080,000	980,000	1,132,000	178,000	286,000	338,000
Wis.,† Ill., Ind. & Ky.	1,933,000	2,229,000	2,056,000	2,660,000	272,000	426,000	857,000
Va., Tenn., Ala. & Ga.	838,000	1,115,000	844,000	1,185,000	272,000	290,000	360,000
Eastern Mo., Ia. & Minn.	1,452,000	1,518,000	1,448,000	1,763,000	625,000	1,502,000	1,747,000
W'n Mo., Neb., Kan. & Okla.	979,000	985,000	935,000	1,220,000	696,000	874,000	1,109,000
Texas	332,000	415,000	326,000	407,000	227,000	215,000	207,000
Colo. & Utah	217,000	275,000	206,000	278,000	174,000	181,000	184,000
Calif.	1,049,000	1,062,000	1,021,000	1,036,000	277,000	364,000	338,000
Ore., Wash. & Mont.	286,000	239,000	271,000	279,000	276,000	403,000	443,000
	13,350,000	14,820,000	14,285,000	17,081,000	4,612,000	6,143,000	8,404,000

*Revised. †Began producing June, 1924.

PRODUCTION, SHIPMENTS AND STOCKS OF FINISHED PORTLAND CEMENT, BY MONTHS, IN 1923 AND 1924, IN BARRELS

Month	Production		Shipments		Stocks at end of month	
	1923	1924	1923	1924	1923	1924
January	7,990,000	8,788,000	5,628,000	5,210,000	11,477,000	14,155,000
February	8,210,000	8,588,000	6,090,000	5,933,000	13,596,000	16,815,000
March	9,880,000	10,370,000	10,326,000	8,995,000	13,045,000	18,189,000
First quarter	26,080,000	27,746,000	22,044,000	20,138,000		
April	11,359,000	11,726,000	12,954,000	12,771,000	11,463,000	17,159,000
May	12,910,000	13,777,000	14,257,000	14,551,000	10,144,000	16,403,000
June	12,382,000	13,538,000	13,307,000	15,036,000	9,168,000	14,903,000
Second quarter	36,651,000	39,041,000	40,518,000	42,358,000		
July	12,620,000	14,029,000	13,712,000	16,614,000	8,081,000	12,319,000
August	12,967,000	15,128,000	14,971,000	16,855,000	6,080,000	10,666,000
September	13,109,000	14,519,000	13,698,000	16,827,000	5,533,000	*8,404,000
Third quarter	38,696,000	43,676,000	42,381,000	50,296,000		
October	13,350,000	14,820,000	14,285,000	17,081,000	4,612,000	6,143,000
November	12,603,000		10,251,000		6,991,000	
December	9,997,000		6,408,000		10,900,370	
Fourth quarter	35,950,000		30,944,000			
Preliminary total	137,377,000		135,887,000			
Amt. of underestimate	83,238		25,118			
Final total	137,460,238		135,912,118			

*Revised.

IMPORTS AND EXPORTS OF HYDRAULIC CEMENT, BY MONTHS, IN 1923 AND 1924, IN BARRELS*

Month	Imports		Exports	
	1923	1924	1923	1924
January	71,686	153,732	74,169	88,586
February	20,529	162,930	88,531	62,606
March	66,521	160,517	98,861	91,224
April	76,899	148,138	85,662	83,200
May	88,480	161,304	103,634	88,850
June	111,559	196,655	77,203	74,064
July	286,106	109,098	82,774	60,139
August	324,008	192,634	73,201	85,883
September	215,785	134,245	77,121	69,470
October	172,051	(†)	74,302	(†)
November	140,590		85,743	
December	104,422		80,487	
	1,678,636		1,001,688	

*Compiled from records of the Bureau of Foreign and Domestic Commerce.
†Imports and exports in October, 1924, not available.

shipments to the following possessions: Alaska, 95 bbl.; Hawaii, 1446 bbl.; Porto Rico, 6580 bbl.

The statistics of imports and exports of hydraulic cement in October, 1924, are not available.

PORTLAND CEMENT SHIPPED FROM MILLS INTO STATES, IN JULY AND AUGUST, 1924*

Shipped to	July (Barrels)	August (Barrels)
Alabama	212,720	185,494
Alaska	1,432	1,053
Arizona	30,474	32,615
Arkansas	129,334	139,515
California	942,273	960,221
Colorado	161,005	174,924
Connecticut	192,957	179,012
Delaware	46,078	49,501
District of Columbia	79,851	80,080
Florida	173,184	198,827
Georgia	107,824	134,819
Hawaii	5,451	1,842
Idaho	23,922	28,042
Illinois	1,533,330	1,404,542
Indiana	744,692	781,376
Iowa	401,855	357,329
Kansas	199,437	228,297
Kentucky	188,068	203,792
Louisiana	109,385	104,683
Maine	50,045	48,807
Maryland	218,371	256,498
Massachusetts	388,173	369,062
Michigan	1,205,309	1,252,561
Minnesota	405,863	392,542
Mississippi	41,506	60,512
Missouri	427,101	435,736
Montana	20,985	26,332
Nebraska	158,955	178,020
Nevada	8,806	9,847
New Hampshire	41,240	46,592
New Jersey	738,895	712,602
New Mexico	22,007	24,153
New York	2,041,145	1,966,885
North Carolina	259,730	383,174
North Dakota	72,154	33,148
Ohio	1,211,851	1,164,939
Oklahoma	177,823	193,464
Oregon	140,656	153,691
Pennsylvania	1,580,596	1,737,633
Porto Rico	0	0
Rhode Island	60,649	63,326
South Carolina	42,238	50,890
South Dakota	70,244	53,360
Tennessee	148,173	176,909
Texas	388,590	379,845
Utah	55,413	41,539
Vermont	35,469	46,512
Virginia	156,644	189,686
Washington	179,521	208,254
West Virginia	226,563	207,811
Wisconsin	586,677	551,562
Wyoming	47,769	46,597
Unspecified	66,488	73,614
	16,558,921	16,782,067
Foreign countries	55,079	72,933
Total shipped from cement plants	16,614,000	16,855,000

*Includes estimated distribution of shipments from five plants in July; from four plants in August.

South Dakota State Cement Plant Quarry Practice

FOR weeks at the state cement plant limestone quarry charges of dynamite have been exploded as a part of the work of opening up the quarry and getting out the limestone for the plant without a single injury. Great care is exercised to prevent accidents, according to the *Rapid City (S. D.) Journal.*

A gasoline-operated well drill bores a 5⅝-in. hole 30 to 40 ft. into the rock. Into this hole is placed from 60 to 70 lb. of dynamite and the charge is exploded. Approximately 800 to 900 tons of rock are moved by the blast and broken up into pieces that can be handled conveniently by the steam shovel which loads the rock into cars ready to be moved to the plant.

The cars hold 5 yd. of rock each. They are pulled by a narrow gage steam locomotive. This locomotive steams up and down the tracks hauling its trains to the first crushing mill, where the limestone, originally in blocks from 2 to 3 ft. in length, is broken into small 2-in. pieces and then sent by belt conveyor to the raw materials storage building.

The face of the quarry reveals a ledge of limestone averaging 40 ft. in height as the workers go farther back in the hillside.

California Limestone Company Fine Grinds Whole Product

THE Kaweah Quarries of Lemon Cove, Tulare county, is the only company in the state of California engaged solely in the manufacture of agricultural limestone and of finely pulverized limestone used in the asphalt paving industry and the making of the higher grades of cement concrete pipe. The plant and quarry represent an investment of over $100,000, and the annual sales are about $60,000. The plant is served with electric current by the Southern California Edison lines, and there are seven motors used, with a total of 287 hp. This plant operates two large gyratory crushers. As the rock is quarried it is broken into pieces not larger than 12x40 in.

This quarried rock is transported by gravity in 4-ton cars to the initial crusher, where it is broken to 3 in., and is then taken by gravity to a second breaker, where it is reduced to ½ in. and less.

This product is elevated to a large bin holding 400 tons and then it is fed by gravity to the pulverizing mills. These mills reduce the limestone to a product of which 88.2% will pass through a screen having 200 meshes to the inch.

This product is being shipped all over the northern part of the state and is used in street paving and in waterproofing concrete used in pipes and in cellars and wherever there is a constant water pressure.—*Fresno (Calif.) Bee.*

Big Demand for Building Materials in New York City

THE volume of building materials that moved into construction in New York City so far in 1924 was greater by approximately 15% than mason material dealers had ever before experienced, says a *Dow Service Building Report.* If it had not been a presidential election year with all the attendant conservation on the part of lending interests and others, and the usual proportion of permits granted had applied to construction projects actually proceeding, the tax upon available supply of basic building commodities would have far exceeded delivery capacity and would have approximated at least 45% of the greatest single year's gross business the New York masons' supply dealers have ever been called upon to meet.

The present state of portland cement illustrates the situation perfectly. Even thus late in the season, practically every mill supplying New York and vicinity is "scraping the sides of its bins" to fill its orders. There are no reserve stocks. Inquiries for cement as reported by firms in New York are "ten times what they were at this time last year" and requests for quotations on cement deliveries here are "20 times" what they were a year ago. Some cement companies have been obliged to buy cement from competing companies to take care of rush orders, but it is now difficult, they say, for them to obtain this accommodation.

Yet there are no indications of general price advances of building materials or of construction costs for next year. On the other hand, the tendency is certainly in the other direction, which supplies good reason why building construction has a remarkably clear track from now on.

Texas Asks for Lower Freight Rates on Highway Material

A MOVEMENT to save Texas taxpayers hundreds of thousands of dollars each year and at the same time to expediate the building of permanent roads has been started by the Texas Highway Association, and the assistance of the state highway department has been solicited.

The plan, as laid before the highway commission, if put into operation, would bring other highly beneficial results, along with its highly desirable objective.

Texas freight rates on crushed rock and gravel used in road building is 57% higher than the rates for the same distances in Louisiana and Oklahoma, President W. E. Lea of the highway commission pointed out. Crushed granite, for which the producers receive 50 c. per cu. yd. in the Llano-Burnet district, is assessed a $3 per cu. yd. freight rate to Orange, Texas, according to data furnished by Mr. Lea. The result of this is that the business of producing road materials is virtually paralyzed, and the roads that are built cost from $1500 to $3000 per mile more for gravel and from $3000 to $10,000 per mile more than if Texas freight rates were in harmony with those of adjoining states.

At lower freight rates, greater quantities of road materials would move. This would restore a degree of prosperity to those sections, such as Llano, which produce building materials, and would improve business in many other lines, along with the gravel pits and rock crushing plants.

With these materials moving in much greater volume, Texas shortline railroads would benefit. At present, if larger rail systems are able to handle the tonnage in other states for less than half the Texas rate, it seems that Texas people and Texas business interests are not getting the best possible deal.—*Port Arthur (Texas) News.*

Make Slag Screenings Into Concrete Brick*

Birmingham Slag Company Sells Ten Million Brick a Year in a Field Where Clay Brick Are Cheaply Made

THIS tells of making concrete brick from slag, but it will interest the crushed stone or sand and gravel producer who has an excess of fine aggregate to dispose of or the regular concrete brick and block maker, as the description of the process is very complete. The success recorded is the more remarkable since it was achieved in a district where clay and shale are plentiful and are right at the mouths of coal mines. —The Editors.

IN the manufacture of commercial sizes of crushed slag, about 10% of the daily production will pass through a ¼-in. screen and is known as slag sand, having a grading about the same as a good concrete sand. For a number of years there was only a small market for this size, necessitating storing it in stock piles which were gradually consuming all available space. After a series of experiments were made it was found that this finely crushed slag possessed a certain amount of cementing qualities, naturally suggesting the manufacture of concrete products. The demand for the various concrete products was investigated and it was decided to manufacture concrete brick.

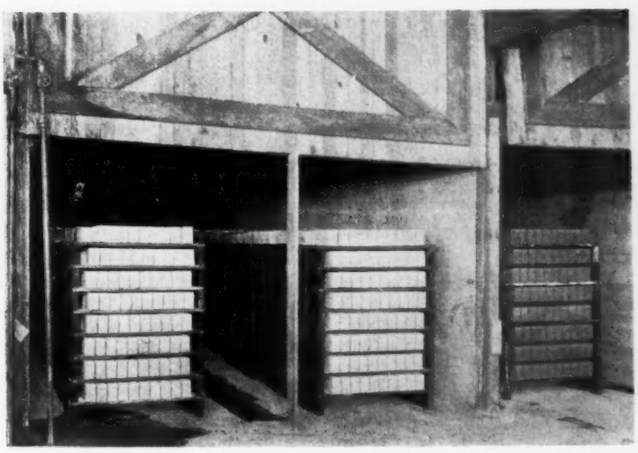
After visiting plants in various parts of the country and consulting operators as to machinery and methods of curing, a plant was designed and built with a capacity of 30,000 bricks per day and sufficient shed storage for 1,000,000 face brick. The original plant used a batch mixer and hand tamping machine, but, because of the roughness of slag, tamping was found difficult with these machines and the mixer would only work at half capacity. As a result, a continuous mixer was installed and all machines fitted with power tampers which increased the capacity of the plant, each of the 12 machines having a capacity of 2000 face brick or 7000 common brick per day. No material is handled by hand, bucket elevators being used to elevate both cement and slag to bins above the mixer. These materials are fed to the mixer by gravity and the concrete in turn is distributed to the hoppers in the rear of the brick machines, which are in batteries of four, by belt conveyors. The concrete is drawn into hand hoppers by the operation of an undercut gate. Then brick are made at each operation directly on a wooden pallet and these pallets are removed from the machines, placed in stacks eight high and are wheeled into steam curing rooms, one stack at a time, by a steel framed buggy with pneumatic tires. The brick are steamed 24 hours, removed from the curing rooms on jack-lift trucks and stacked on the yards for curing until ready for shipment.

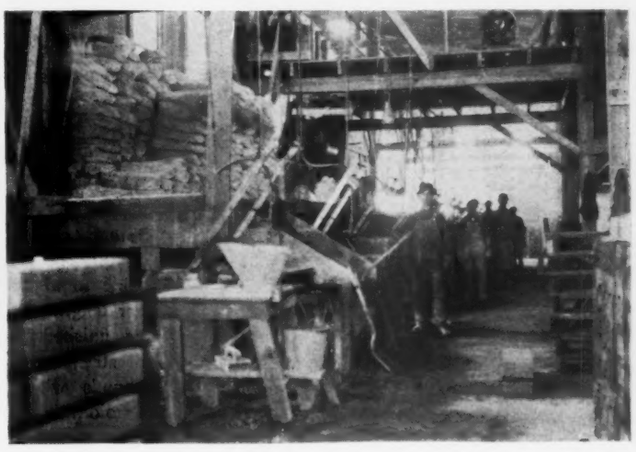
Great care is exercised in the selection of material for concrete brick. Only portland cement is used. The slag should be graded so as to obtain a maximum density without impairing the strength of the product, thereby getting a good hard brick with an ideal percentage of absorption. The slag is handled so as to prevent segregation of the material which would cause alternate batches of coarse and fine slag to go into the mixer. To accomplish this a storage bin was built as an inverted pyramid and the material dumped into the bin in a conical pile. The material on leaving the bin recombines and gives a consistent gradation.

Mixing should be as thorough as operating conditions will allow. Although it is conceded that a batch mixer gives a better mixed concrete, the variation of the mix in a continuous mixer is so small that it does not vary the compressive strength of the brick to any serious extent. As a semi-dry mix is used much care must be taken to see that all water possible is used without excess to obtain workability, and maximum strength from the cement. The mixer is automatic in proportioning the slag, sand and cement and a check is kept on this through the finished product to be sure that the proper amount of cement is used per thousand brick.

In the actual making of the brick the draw-blade type machine has been found to be satisfactory in that this machine is simple, easily repaired and can be kept in positive alignment. Wooden pallets are placed on the body of the machine and the blades are drawn forward and a header bar is clamped on the front of the blades to complete the mold. As before mentioned concrete is drawn from the large hopper at the rear of the machine into the hand hopper by the operator. The material is pulled over the mold and tamping is done by an automatic power tamper. These tampers have five feet, each of which tamps two brick exerting a pressure of 100-ft.

*Part of a paper read by C. E. Ireland, of the Birmingham Slag Co., before the New York meeting of the Iron and Steel Institute October 24, 1924.





Left—Part of curing room. Right—The plant interior

pounds at each stroke. Five series of strokes are used in each operation giving a total pressure of 500-ft. pounds per brick. After the brick are tamped excess material is cut off with the hand hopper and the common brick are trowelled to a smooth surface, removed from the machine and placed in stacks ready for the curing room.

Face brick are made by supplementing the operations used in the production in common brick. After the concrete is tamped in the mold and the surplus material struck off, a mineral coloring in powdered form, is sprinkled over the surface and thoroughly worked in with a wooden float. Enough water is added to make the facing plastic. The brick are then trowelled with a steel float and another coat of color applied which is stippled with a rice root brush to make a rough texture, or made into a wire cut by drawing a steel toothed comb across the face. The face brick are made in several different colors and can be furnished either wire cut or rough texture. Making the face and body of the brick in one operation produces a mololithic product impervious to water.

Brick plant of Birmingham Slag Co. which uses product formerly stored as waste

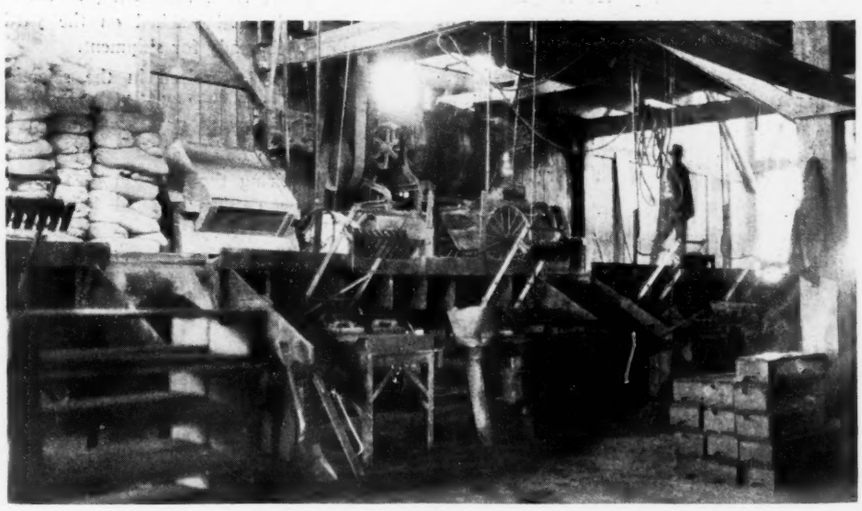
All brick are cured in steam rooms, using low pressure saturated steam. This steam enters the room through pipes laid in trenches in the center of the concrete floor. A heat of 125 deg. is maintained when common brick are being cured and 90 deg. when face brick are being cured. The brick are allowed to remain in the curing rooms for 24 hours, which is equivalent to about seven days of air curing and enables the brick to be stacked on the yard immediately after being removed from the curing room. In no case should the temperature go above 90 deg., when face brick are being cured as any heat above this will cause efflorescence and ruin the product entirely.

From the curing rooms the brick are hauled to the yard on jack-lift trucks, carrying 400 brick at a load, and stacked in rows 15 brick high, 10 brick wide, leaving an air space about 4-in. between rows to expedite the setting. As the cementing qualities of slag are depended upon for part of the ultimate strength of the brick no water is added to them after they are stored on the yard because slag sets very slowly when kept wet. They are left on the yard to air cure for 30 days before shipping.

Because of the cementing qualities of the slag a much leaner mix can be used than in the production of a concrete brick using sand as the aggregate. It has been found that a one to seven mix by volume is sufficient to give compressive strength of 2000 lb. per square inch. Even a leaner mix than this can be used if there is ample space available to allow the brick to cure for a greater length of time.

The finished product is a brick of unusual strength which increases with age and bonds with the mortar, producing a semi-mololithic wall usable in every type of building construction. The concrete brick is not an imitation of a clay or shale brick but is a brick obtained by a different method of manufacture and using different materials. Concrete brick are just as hard and waterproof as clay or shale brick. They bond readily with the mortar and will not break away from the mortar in the wall because of expansion or contraction. This is because mortar and concrete brick are composed of ingredients so nearly alike that the coefficient of expansion and contraction is practically the same. Because of the fact that they are not burned no deformities occur from uneven distribution of heat as is the case with clay or shale brick. A concrete brick once made true remains true throughout.

Although our concrete brick are manufactured in the heart of one of the best clay brick and shale deposits in the South and in the midst of coal fields, the demand for them has steadily increased since operations were started in 1921. They are moving now at the rate of 10,000,000 for the year 1924. The sale price of our concrete brick, marketed under the trade name of "Slagtex" in this district, is $12.50 per thousand for commons and from $22.50 to $33.50 per thousand for face brick. The market price of "Slagtex" commons is about the same as that of clay commons, but the price of "Slagtex" face brick in most instances is slightly lower than either that of the clay or shale face brick.



Power tamping machines that make 2000 face or 7000 common brick per day

Oklahoma Rock Products

ACCORDING to local papers, Charles N. Gould, the Oklahoma state geologist, pointed out to the realtor's convention in Oklahoma City that the state had:

Coal, 79,000,000,000 tons. Enough to last, at the present rate of mining, 26,000 years.

Gypsum for plaster, enough to keep one hundred mills busy for 34,000 years.

Limestone, enough to furnish all the cement rock for America.

Clay and shale, enough to burn all the clay products for the entire world.

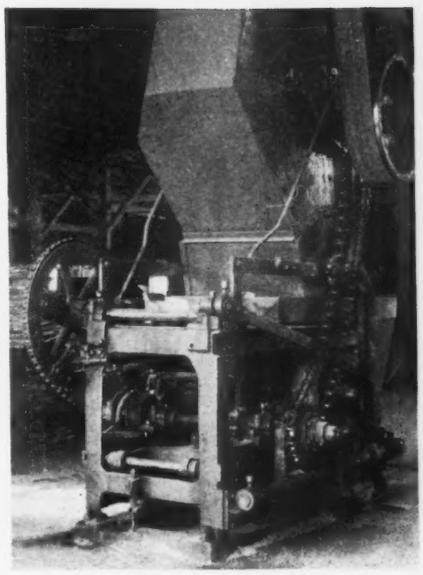
Cement Company Makes Concrete Products

Dixie Portland Cement Co. Installs Block and Tile Plant at Its Gravel Plant in Chattanooga, Tenn.

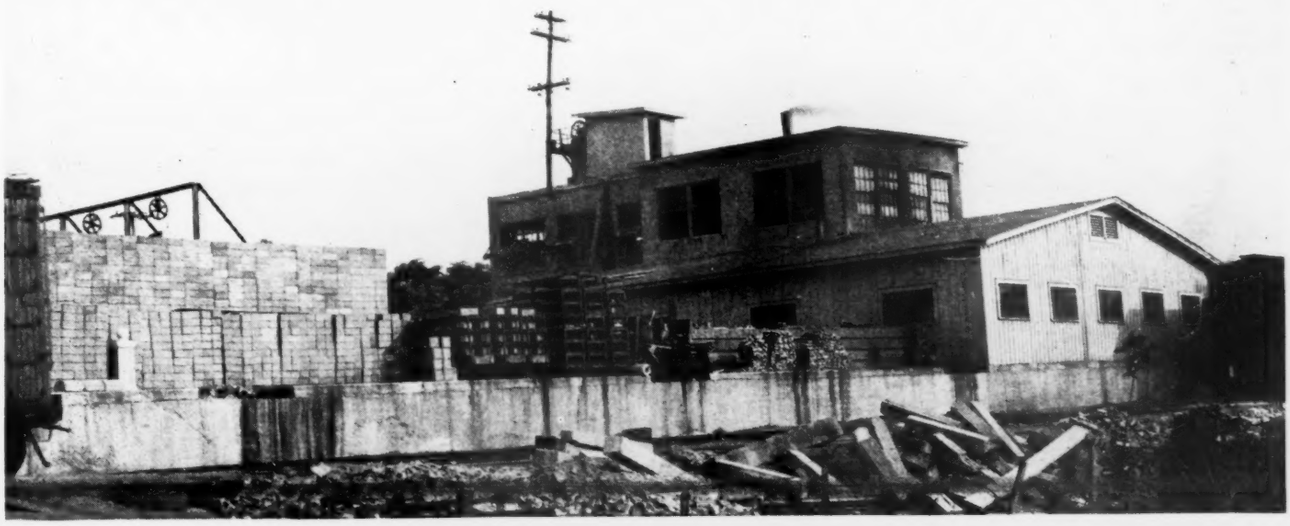
THE concrete block plant of the Dixie Sand and Gravel Co. is unique in that it is part of a business that makes all its raw material, including cement, for it is one of the subsidiaries of the Dixie Portland Cement Co. of Chattanooga, Tenn. The plant is housed in a well built structure near the sand and gravel plant on the Tennessee river bank. The main building is covered with cement stucco and there are many metal sash windows that provide abundant air and light. The floors are of concrete.

The process of block making is the familiar one of forcing the mixed concrete into molds by a mechanical tamping machine. The raw materials are conveyed to the mixing room on the second floor by a belt conveyor (the cement being sent up in sacks) and there combined in a mechanical concrete mixer. From the mixer the concrete is chuted to the ground floor and the block making machine which was made by the McIntire Machine Co. of Detroit.

The plant makes the regulation block and it also makes a very handsome roofing tile. But perhaps the most interesting work of this plant is the amount of "special shape" work that is done. Lamp posts, gate posts and all sorts of architectural ornaments are



Power block machine



Block plant of Dixie Sand and Gravel Co.

Left—Elevator that brings up cement in bags. Right—Looking into the curing rooms

made, and while the company never makes these without special orders, it would seem from the amount of such work that the demand for it must be good.

Many of these special forms are made from wooden patterns and cast in flasks in a way that somewhat resembles foundry practice. A bandsaw and other woodworking machines are a part of the equipment and are used in making flasks and molds.

Blocks and other shapes are steam cured in a kiln room built of concrete blocks and fitted with steam and water pipes.

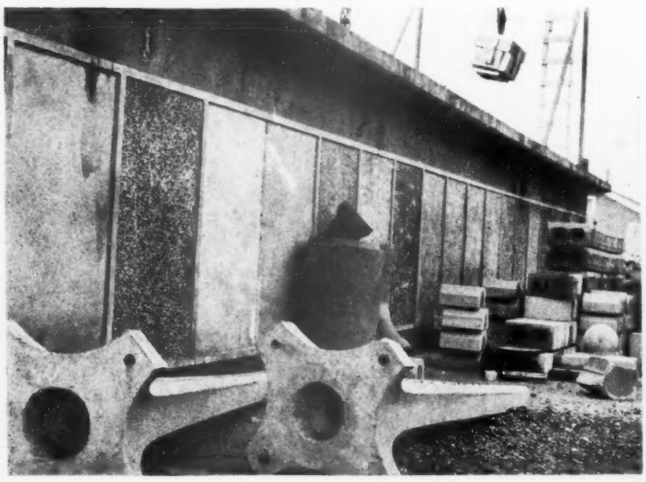
The storage yard is equipped with a light crane that makes the handling of material easy and also prevents damage from careless handling.

George Kilian, the secretary of the Dixie Portland Cement Co., takes especial interest in this branch of the business. He is a firm believer in the future of concrete products in building and he furthermore believes that such products must win their way not as imitations or substitutes but because they have certain advantage which no other products possess. Notable among these advantages is the use of color. Outside surfaces can be made of practically any color desired and the color will be permanent. The limited range of colors possible to clay products, for example, is greatly surpassed by the colors made possible by the use of permanent mineral colors with concrete. And the shapes possible to concrete are only limited by the skill and ingenuity of the designer.

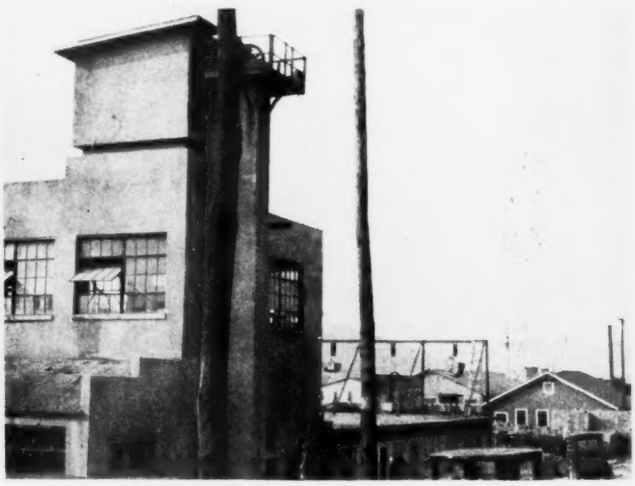
One of the pictures shows a pair of gate posts in front of the office of the plant which can hardly be called beautiful but which none the less illustrate the possibilities of concrete applied to ornamental work. A reinforcing rod passing through the corners of the cube and down into the post provides sufficient rigidity.

The company has a handsome exhibit of its products in its offices in Chattanooga. An interesting showing at the yard is that of various kinds of portland cement stucco.

Richard Hardy is president of the Dixie Sand and Gravel Co., George W. Millen is vice-president and George Kilian is secretary and treasurer. The offices of the company are in the James building in Chattanooga, Tenn.



Left—Special shapes and stucco samples. Right—Roofing tile and block in yard



Left—A "stunt" to show cement products possibilities. Right—Front of plant

How They Advertise Cement Products in California

A RECENT number of the *Los Angeles Examiner* contains the following notice:

"A demonstration of a fireproof concrete tile construction building will be given Saturday at 4601 Hollywood boulevard at 2 p. m., according to an announcement made yesterday by Harley Wadsworth, representing the Southern California Manufacturers of Cement Products. The building has been constructed at the above address and will be filled with inflammable material and set on fire. Officials of the Portland Cement Association, the police and fire departments, and a large number of architects, contractors and others interested in building will be present. Hennesy's orchestra will furnish music for the affair. The public has been invited to attend."

"He Laughs Best Who Laughs Last"

"Burned Brick" Vs. Concrete Brick

JUST about a year ago the editor of ROCK PRODUCTS, describing his visit to the Shope concrete brick exhibit at the Pacific International Live Stock Exposition, Portland, Ore., mentioned the fact that a few feet from Mr. Shope's booth was the booth of the clay brick manufacturers, where a prominently displayed sign read: "If it isn't burnt, it isn't a brick."

Last summer the great pavilion, or exhibit hall, went up in smoke. It has been rebuilt and was reopened November 1 with the live stock show. A writer in the *Portland Daily Journal*, November 1, states: "But one very small part of the original structure was left intact. This is a fireplace and brick display which stands today with slight but unmistakable signs to bear mute evidence of what it went through, but proving to the world that it is all its builders had claimed for it."

O. M. Plummer, general manager of the Pacific International Live Stock Exposition Co., pays this tribute in a letter to Mr. Shope:

I wish I had words to felicitate you properly over the wonderful showing of your Shope brick as demonstrated in the fireplace which you constructed two years ago at the Pacific International Live Stock Exposition and which went through the terrific fire of Wednesday afternoon, July 23, 1924, absolutely intact; the only piece of work of any kind in the entire ten-acre building which was not practically level to the ground.

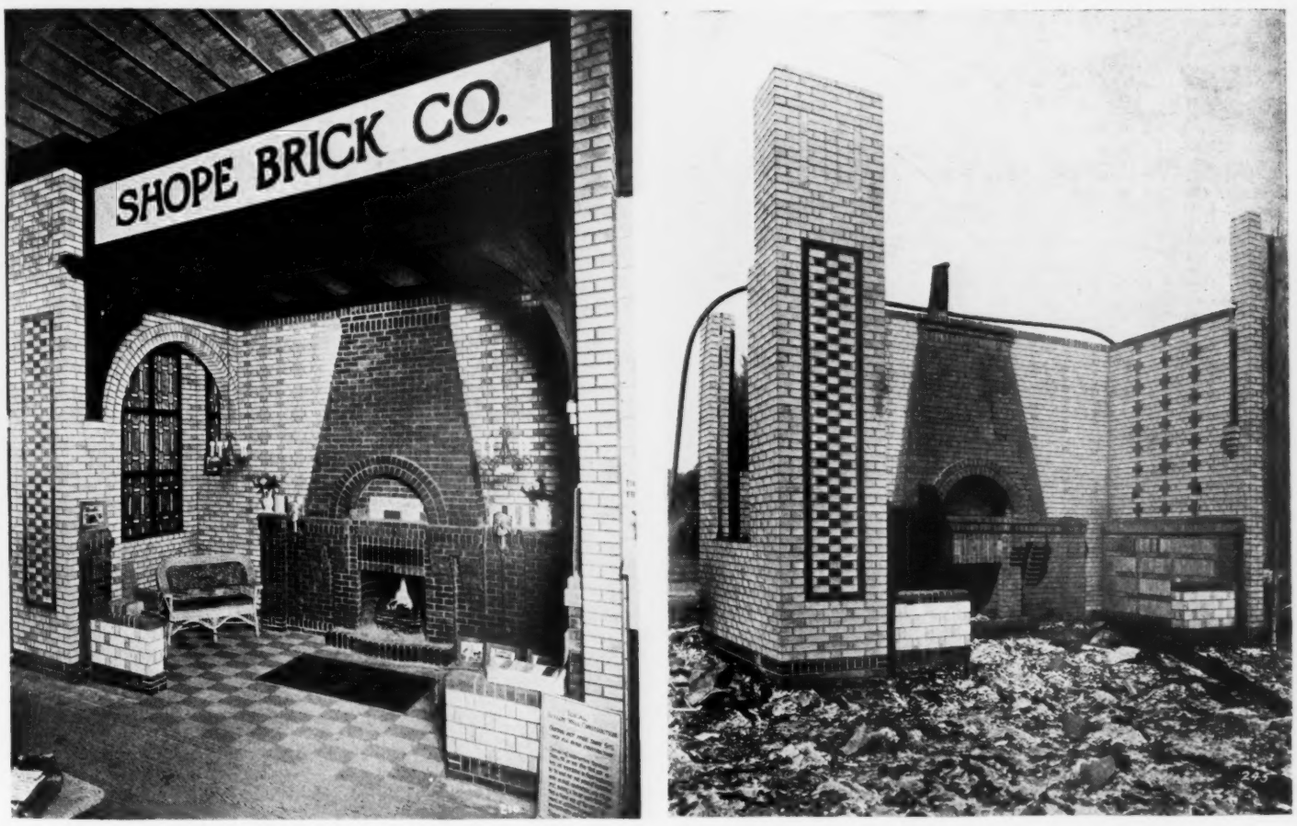
I was at the fire 11 minutes after it started and practically saw the whole thing go up in smoke and into ashes. As I stood there and saw your fireplace standing stark, although frightfully hot, it occurred to me that this was a wonderful thing for your organization and for the product which you are putting out. I think I had heard it stated by some people in previous years that your brick would not stand heat.

Ruins of the exposition building after the fire of July 23, 1924

We had in this same division with your fireplace bronze tablets on a cut stone standard, one corner of this tablet melted off and they tell me it required 1700 deg. of heat to melt this particular composition; no place in our entire building was more hot than where your fireplace stood.

After the fire was over, the next morning, I was out there about 5 o'clock. It was cool enough then to get around and I marveled again at the stability of your fireplace structure and at the lack of discoloration, cracking or other damage to any of the brick in the entire structure.

For the reason that this was such an outstanding example of what a heat resisting brick you had, I asked our constructing concern to be very careful indeed in replacing the building, and the new structure which we have has been run up along the same lines as the old one, leaving your fireplace intact as it was before the fire and I'll venture to say that few people who attend the Pacific International this year, the week of November 1 to 8 inclusive, unless they are particularly told, will ever know that this fireplace probably has been through the fiercest test ever given to a similar construction.



Left—Shope brick exhibit at the Pacific International Live Stock Show, Portland, Ore., November 4-11, 1922. Right—Shope brick exhibit at the Pacific International Live Stock Show, Portland, Ore., after the fire of July 23, 1924

Traffic and Transportation

By EDWIN BROOKER, Consulting Transportation and Traffic Expert,
Munsey Building, Washington, D. C.

Proposed Changes in Rates

THE following are the latest proposed changes in freight rates up to the week beginning October 25; also a few freight rate changes up to week beginning November 10:

Central Freight Association Docket

9403. Crushed stone and articles grouped with same in N. Y. C. Trf. I. C. C. L. S. 1158. Kankakee, West Kankakee, Lehigh and Van's Siding, Ill., to Lakeside, Harbert, Sawyer, Bridgman, Livingston and Stevensville, Mich. Present, $1.13 per net ton; proposed, $1.01 per net ton.

9417. Crushed stone. Melvin, Ohio, to Troy, Ohio. Present, 14½ cents; proposed, 90 cents per net ton.

9419. Crushed stone. Kenton, Ohio, to Ohio. Present, 70 cents per net ton to Horton, West Mansfield, Luna, Raymonds, Peoria, Otter, Marysville and Dipple, Ohio; proposed, 60 cents per net ton.

9423. Sand. Midway, Ohio to Fostoria, Ohio. Present, $1 per net ton; proposed, 80 cents per net ton.

9424. Crushed stone. Carey, Ohio, to Fort Wayne, Ind. Present, 15 cents; proposed, $1.04 per net ton.

9428. Sand and gravel. Winona Lake, Ind., to Lima, Ohio. Present, 90 cents per net ton; proposed, 80 cents per net ton.

9430. Sand and gravel. Navarre and Massillon, Ohio, to Ashtabula and Painesville, Ohio. Present, $1.40 per net ton; proposed, $1.20 per net ton.

9460. Crushed stone. Kenneth, Ind., to Southport, Ind. Present, $1.27 per net ton; proposed, $1.10 per net ton.

9476. Ashes, cinders and slag. Columbus, East Columbus and South Columbus, Ohio, to Dana, W. Va. Present, $2.20 per net ton; proposed, $1.75 per net ton.

9488. Lime. Carey, Ohio, to Coldwater, Mich. Present, 14 cents; proposed, 14½ cents.

9490. Sand and gravel. South Dayton, Ohio, to Connersville, Ind. Present, 13½ cents; proposed, $1.26 per net ton.

9503. Crushed stone. Dunkirk, Ohio, to Detroit, Mich. Present, 16½ cents; proposed, $1.32 per net ton.

9512. Furnace slag. Columbus and South Columbus, Ohio, to Ashland, Ohio. Present, $1.30 per net ton; proposed, $1.10 per net ton.

9513. Crushed stone. Lake Shore Quarry, Ohio, to Twinsburg, Ohio. Present, 15 cents; proposed, 90 cents per net ton.

9515. Crushed stone. White Sulphur, Ohio, to College Corner, Ohio. Present, 17 cents; proposed, $1.20 per net ton.

9516. Crushed stone. France Quarries, Ohio, to (A) Bonita, Sharon Center, Copley, Schocalog Road, Fairlawn, Hawkins Ave.. Portage Park, Merriman and Akron, Ohio. (B) Fraser, Boyds, Good Hope, Ghormleys, Greenfield, Thrifton, Fruitdale, Humboldt, Bainbridge, Dills, Storms, Spargusville, Harris, Summit, Denver, Peck, Sosco and Waverly, Ohio. Present (A), $1 per net ton; (B) 6th class basis; proposed, 90 cents per net ton; (B) Fraser to Bainbridge, inclusive, 90 cents per net ton; Dills to Waverly, inclusive, $1 per net ton.

9517. Gravel and sand, other than blast, engine, foundry, glass, molding or silica. Jamestown, Penn., to Pennsylvania (in cents per net ton, except as noted):

To	Present	Proposed
Greenville, Penn.	80	70
Shenango, Penn.	80	70
Transfer, Penn.	80	70
Sharpsville, Penn.	80*	70
W. Middlesex, Penn.	90	80
Pulaski, Penn.	90	80
New Castle, Penn.	105	90
Mahoningtown, Penn.	105	90
Ellwood Jct., Penn.	13†	105
Kenwood, Penn.	13½†	105
Rochester, Penn.	13½†	105
Mercer, Penn.	125*	105

*Rates checked intermediate.
†Sixth class rates in cents per 100 lb.

9519. Sand and gravel. Deeter, Ind., to Indiana. Present, 85 cents to North Manchester, Bolivar, Urbana and Speichers, Ind., and 88 cents per net ton to Wabash, Ind. Proposed, 75 cents to North Manchester, Ind., and 80 cents to Bolivar, Urbana, Speichers and Wabash, Ind.

9526. Sand, viz., blast, engine, foundry, glass loam, marl, molding and silica. Thornton Jct., Penn., to Cleveland, Ohio. Present, no rates in effect; proposed, $1.13 per net ton.

9535. Sand, gravel. Winona Lake, Ind., to Marion, Ind. Present, 13½ cents; proposed, $1 per net ton.

9554. Molding sand. Michigan City, Ind., to Springfield and Edwardsville, Ill. Present, $2.02 per net ton to Springfield, and $1.89 per net ton to Edwardsville, Ill.; proposed, $1.89 per net ton to Springfield, and $2.14 per net ton to Edwardsville, Ill.

9559. Crushed stone. Melvin, Ohio, to Oxford, Ohio. Present, 15 cents; proposed, $1 per net ton.

9562. Crushed stone and fluxing stone. Piqua, Ohio, to New Comerstown, Ohio. Present, 18½ cents; proposed, $1.10 per net ton on crushed stone, and $1.33 per gross ton on fluxing stone.

New England Freight Association Docket

7196. Lime. Great Barrington, Mass., to points in Trunk Line Territory, also stations on B. & A. and B. & M. railroads on same basis as now published from Lee and West Stockbridge, Mass., shown in Items 160 and 285 of N. Y. N. H. & H. R. R. I. C. C. F2674 and Items 80 and 82 of N. Y. N. H. & H. R. R. I. C. C. F2677. Reason: Equalization of competitive conditions.

7212. Lime. Ashley Falls, Great Barrington, Lee, Pittsfield, Sheffield, West Stockbridge, Mass.; Canaan, Danbury (Stearns Lime Co. Siding), East Canaan, New Milford and Redding, Conn., to Rochester, N. Y., 20½ cents via N. Y. N. H. & H. R. R.-L. V. R. R. Reason: To meet competition.

7218. Lime. Springfield, Vt., to stations on the N. Y. N. H. & H. R. R. via Springfield Terminal Ry., Charlestown, N. H., B. & M. and N. Y. N. H. & H. Railroads, on same basis as now published from Cavendish, Vt., by the Rutland R. R. Reason: To meet the rates from Cavendish, Vt., via the Rutland R. R.

7225. Lime. Switching at East Canaan, Conn., $5 per car, to apply on traffic to be processed and reshipped. Reason: To meet competitive conditions.

7226. Lime. Minimum weight, 60,000 lb., in bulk, New Milford and Redding, Conn., to Harlem River, N. Y., 7½ cents. Reason: To meet competition.

7257. Cement (common, hydraulic, natural or portland). Hudson Upper, N. Y., to stations on Pittsburgh, Shawmut and Northern R. R., 16 cents. Reason: To publish same rates as now in effect to contiguous territory.

7277. Cement (common, natural, hydraulic or portland). Hudson Upper, N. Y., to points on Middletown and Unionville, R. R., 15½ cents. Reason: To place Hudson Upper on a basis comparable with Alsen, N. Y.

Illinois Freight Association Docket

2843. Sand and gravel. Carloads, minimum weight 90% of marked capacity of car (except when loaded to cubical or visible capacity actual weight will apply) from Mt. Carmel, Ill., to Nason, Ill. Present, combination; proposed, $1.13 per net ton.

2847. Stone, crushed. Carloads, minimum weight 90% of marked capacity of car used, from Eldred, Ill., to Clark, King, Titus, Bakersfield and East Hardin, Ill. Present, to Clark, King and Titus, 76 cents per net ton, to Bakersfield and East Hardin, 88 cents per net ton; proposed, 63 cents per net ton.

Southern Freight Association Docket

16571. Absorption of switching charges on sand and gravel, carloads. It is proposed to amend the note published in L. & N. R. R. Trf. G. F. O. 48B, I. C. C. A15305, in connection with rates on sand and gravel, carloads, from Montgomery, Ala., to Anniston, Ala., Talladega, Ala., Bessemer Ala., Birmingham, Ala., and Ensley, Ala., to read as follows:

"The L. & N. R. R. Co. will absorb connecting line switching charges at point of destination not exceeding $2.25 per car." The purpose of the proposed revision is to clarify the present rule which reads as follows: "The L. & N. R. R. Co. will absorb connecting line switching charges not exceeding $2.25 per car."

16600. Slag and chert. Carloads, minimum weight 40,000 lb., from Birmingham, Ala., and Group to Roberts, Miss. Combination or class rates now apply. Proposed, $1.76 per net ton, based on the proposed Alabama-Georgia scale, reduced 10% for distance of 252 miles.

16336. Cement. It is proposed to cancel the rate of 19½ cents per 100 lb. on cement from Chattanooga, Tenn., to Virginia cities, as shown in Agt. Speiden's Eastbound Trf., I. C. C. 838, leaving the rate of 26 cents per 100 lb., as published in Agt. Glenn's Cement Trf. No. 4, I. C. C. A455, to apply.

16640. Crushed stone and sand and gravel, carloads. It is proposed to advance rates on crushed stone, carloads, also sand and gravel, carloads, from Decatur, Ala., to Whitehead and Lewisburg, Tenn., from 5 cents to 6 cents per 100 lb., to be the same as the rates on these commodities from and to other points on the L. & N. R. R. for similar distances.

16644. Crushed stone, marble or slate. Carloads, from Tate, Ga., to Jackson, Tenn. Present, $6.47 (Whitestone, Ga., combination); proposed, $2.93 per net ton, same as rate in effect to Memphis, Tenn.

16649. Carloads, minimum weight on mixed carloads of cement, lime and wall plaster. It is proposed to increase the minimum weight applicable in connection with mixed carload shipments of cement, lime and wall plaster, from Louisville, Lexington and Frankfort, Ky., Cincinnati, Ohio, Covington and Newport, Ky., to L. & N. R. R. local stations from 40,000 to 50,000 lb., the increased minimum being in line with minimum weight provided under Item 30 of Sup. 29 to Exceptions 3 to Southern classification, also with description H as shown on page 18 of L. & N. R. R., Ohio and Mississippi River Points Outbound Local Commodity Trf I. C. C. A15193.

16658. Gravel. Carloads, from Montgomery, Ala., to River Falls, Ala. Present, 6½ cents per 100 lb.; proposed (intrastate only), $1.04 per net ton, same as produced by the proposed Alabama-Georgia scale for the distance.

16721. Cement. Carloads, from Chattanooga and Richard City, Tenn., to L. & N. R. R. Eastern Kentucky Division (Lexington and Maloney Branch) stations, North Winchester to Maloney, Ky., inclusive, and branch line stations on the Eastern Kentucky Division and Cumberland Valley Division of the L. & N. R. R., combination rates now apply. It is proposed to establish rates on basis of the Fourth Section Committee's cement scale.

16727. Gravel. Carloads, from Camden, Tenn., to L. & N. R. R., Clarksville Mineral Branch stations. Class N rates now apply. Proposed: To Hortense, Tenn., $1.17; Sylvia, Woodlawn, Maney, Van Leer, Slayden, Marion, Louise, Tenn., $1.27; Lone Oak, Eaton and Hackberry, Tenn., $1.42 per net ton. Proposed rates are based on the L. & N. R. R. standard scale for the joint line distance, increasing this scale the difference which obtains in the proposed Georgia and Alabama scales between single and joint line hauls.

16736. Slag. Carloads, from Birmingham, Ala., and Group to C. of Ga. Ry. stations, viz.: Buena Vista, Peach, Williams Spur, Doyle, Putnam, Walls Crossing, Ellaville, Provo, LaCrosse and Nacora, Ga. It is proposed to reduce present rates to basis of the proposed Georgia slag scale.

16737. Cement. Carloads, from Leeda, Ala., to Tallassee, Ala. Present, 16 cents per 100 lb.; proposed, $2.99 per net ton, same as rate in effect from Birmingham, Ala.

16749. Crushed stone, sand and gravel. It is proposed to authorize a mileage scale for use in establishing rates on crushed stone, sand and gravel, in straight carloads, between all stations on the L. & N. R. R. where circumstances necessitate the establishment of commodity rates.

16769. Cement. Carloads, from Kingsport, Tenn., to L. & N. R. R., Cumberland Valley Division and branches. No joint through rates in effect. It is proposed to establish rates to be the same as checked in by the Fourth Section Committee, observing present rates to junction points as minima. Statement of proposed rates will be furnished interested parties upon request.

16788. Sand and gravel, carloads. In order to avoid confusion, it is proposed to publish rates on sand and gravel, carloads, between points on the Atlanta division of the N. C. & St. L. Ry. in Georgia, based on the June 24, 1918, rates, brought up to date, in lieu of the present rates which are the Class P rates in connection with Agt. Speiden's Tariff 75D.

16789. Sand and gravel. It is proposed to establish rates on sand and gravel, carloads, from Sewanee, Tenn., to L. M. N. R. R. stations on same basis as was used in making rates from Estill Springs, Tenn., in lieu of the present Class N

rates. Present and proposed rates to representative points are as follows (in cents per net ton):

To	Present	Proposed
Bowling Green, Ky.	390	163
Peytona, Tenn.	320	163
Ridgetop, Tenn.	320	163
Midwest, Tenn.	340	163
Riversburg, Tenn.	390	163
Decatur, Ala.	430	163
Athens, Ala.	430	163
Loretta, Tenn.	410	163
Tuscumbia, Ala.	430	183

16795. Gravel and sand, usual description. Carloads, from Mitylene, Ala., to Ashburn and Vienna, Ga., and G. S. & F. Ry. local stations, via., Pinehurst. Findlay, Richwood, Wenona, Arabi, Sibley, Dakota and Worth, Ga. It is proposed to reduce present rates to basis of $1.58 per net ton, made on basis of the proposed Georgia scale, reduced 10% for the short line workable distance.

16798. Sand and gravel. Carloads, minimum weight 40,000 lb. from Montgomery, Ala., to Ruffner, Ala. Present rate on sand $17.50 per car 30,000 lb. excess in proportion; gravel, $1.30 per ton, same as rate to Birmingham, Ala., and other points in the Birmingham Group.

16810. Slag, carloads. It is proposed to establish the following rate on slag, carloads, usual description, from Birmingham, Ala., and group to stations on the S. A. L. Ry. between Savannah, Ga., and Jacksonville, Fla.: To stations Pressley, Ga., to Thalmann, Ga., inclusive, $2.21; to stations Bladen, Ga., to Panama, Fla., inclusive, $2.25 per net ton. Proposed revision represents reductions.

16823. Sand and gravel. It is proposed to amend the description applicable on sand and gravel, in mixed or straight carloads, from Chattanooga, Tenn., and group, as per Agt. Glenn's I. C. C. A397 (Chattanooga Tariff No. 6), to read: "Sand and gravel, in mixed or straight carloads, carload minimum weight 90% of the marked capacity of car, except when cars are loaded to their visible capacity, actual weight will govern, per ton 2000 lb." The present minimum weight is marked capacity of car.

Southwestern Freight Bureau Docket

2519. Sand and gravel. To establish the following distance rates on sand and gravel, carloads, minimum weight marked capacity of car, but not less than 80,000 lb., from Ft. Givson, Dills and Verknewy, Okla., to points in Arkansas and Missouri on the St. L.-S. F. Ry., north of Van Buren, Ark. Rates in cents per 100 lb.:

60 miles and over	55	4
65 miles and over	60	5
70 miles and over	65	5
75 miles and over	70	5
80 miles and over	75	5
85 miles and over	80	5½
90 miles and over	85	5½
95 miles and over	90	5½
100 miles and over	95	5½
105 miles and over	100	5½
110 miles and over	105	5½
115 miles and over	110	6½
120 miles and over	115	6½
125 miles and over	120	6½
130 miles and over	125	6½
135 miles and over	130	7

Shippers contend that the present scale of rates to points in northwest Arkansas result in much higher transportation cost than when similar material moves from points in the Joplin District and that they are unable to compete.

2526. Limestone. To establish the following distance scale, on ground limestone, carloads, minimum weight 50,000 lb., from Harrys, Texas, to Louisiana points:

Miles	Rate, Cents	Miles	Rate, Cents
170	9	300	11½
175	9	310	12½
180	9	320	12½
190	10	330	12½
200	10	340	12½
210	10	350	12½
220	10	360	13½
225	10	370	13½
230	11	380	13½
240	11	390	13½
250	11	400	13½
260	11	450	14½
270	11½	500	15½
275	11½	550	16
280	11½	600	17
290	11½	650	18

Shippers state that there are no joint through commodity rates published from Harrys, Texas, to points in Louisiana other than to points in the Shreveport Group, and request rates that will enable them to reach territory in which a great many road-building projects are now in progress.

2536. Cement. To establish a rate of 23½ cents per 100 lb. on cement: portland, hydraulic and paving, carloads, minimum weight as per S. W. L. Trf. No. 90E, from Ada, Okla., to stations on the Yazoo & Mississippi Valley R. R., Vicksburg, Miss., and South. It is stated that at the present time a rate of 23½ cents per 100 lb. is published for application from Ada to New Orleans, La., in connection with the Y. & M. V. R. R., and in view of this rate it is desired that it be made applicable at intermediate points via the route to which the New Orleans rate applies, and which is through Vicksburg.

2577. Cement. To establish a rate of 21½ cents on cement, carloads, as described in S. W. L. Trf. No. 90E from Harrys and Eagle Ford, Texas, to Ruston, La., this rate to be observed as a maximum at intermediate points. Clay to Winnfield, La., inclusive, where the rate is now the same as Ruston, or 24½ cents. It is stated that the C. R. I. & P. Ry. is at a disadvantage under the present adjustment, and they feel that they should be permitted to meet competition at Ruston, La.

2581—Chats, stone, etc. To establish the same rates on chats, stone, etc., as described in Item No. 4104-C of S. W. L. Trf. No. 26X, from points in Oklahoma on the Northeast Oklahoma R. R. and Miami Mineral Belt R. R. to points in Texas as now published therein from various other Oklahoma points. It is stated that there is a large production of chats and stone on the two lines mentioned above and, therefore, the joint line mileage scale should be made applicable from points on these two lines.

2647. Cement. To establish the following rates on cement, carloads, as described in S. W. L. Tariff No. 90E, from Harrys and Eagle Ford, Texas:

Indexes	To stations	Cents
7450	Post Pipe Co. Spur to	
7405	Guernsey, Ark.	20½
7400	Hope, Ark.	20½
7395	Chelsea, Ark., to	
7365	Gurdon, Ark.	20½
7360	Smithton to	
7270	Traskwood, Ark.	20½
7265	Haskells to	
7230	Cypress Jct., Ark.	20½
7225	Little Rock and	
7215	North Little Rock, Ark.	20½
7210	McAlmont to	
7140	Bald Knob, Ark.	23
7135	Russell to	
7105	Nuckles, Ark.	23
7100	Newport to	
7075	Minturn, Ark.	23
7070	Hoxie to	
7065	Walnut Ridge, Ark.	23
7060	Murta to	
7000	Moark, Ark.	26½
9085	Dolph to	
9105	Nashville, Ark.	20½
8985	Doane Spur to	
9080	Pike City, Ark.	26½
8920	Henry to	
8975	Hot Springs, Ark.	20½
9110	Camden Branch Jct. to	
9230	El Dorado, Ark.	20½
9235	Edwards Spur to	
9305	White, Ark.	20½
10345	Vaughn to	
10360	Bastrop, La.	20½
10370	Oak Ridge to	
10390	Rayville, La.	20½
10395	Archibald to	
10470	Clayton, La.	21½
9310	Huttig, Ark.	20½
10475	Litro to	
10550	Farmersville, La.	20½
8915	Chemical Spur to	
8860	Atwood Spur, Ark.	20½
8420	Sweet Home to	
8490	Brewster Spur, Ark.	22½
8495	Pine Bluff, Ark.	20½
8500	Fairfield to	
8605	McGehee, Ark.	20½
8615	Trippe to	
8640	Hurd's Spur, Ark.	20½
8645	Masonville Spur to	
8650	Dermott, Ark.	20½
8715	Decker to	
8760	Kimball, Ark.	20½
9600	Jones Spur to	
9650	Sicard, La.	20½
9655	Monroe, La.	20½
9660	Cobb Spur to	
9765	Rochelle, La.	21
9770	Georgetown to	
9855	Granger Spur, La.	21½
9865	Annadale to	
9880	Forest Hill, La.	23½
9885	Long Leaf, La.	23½
9890	McNary to	
10025	Manchester, La.	23½
10030	Lake Charles, La.	23½
8655	Baxter to	
8710	Warren, Ark.	23
8765	Luna to	
8775	Connerly, Ark.	20½
8780	Bayou Macon to	
8805	Renfrow Spur, Ark.	23
8810	Loyd's to	
8845	Crossett, Ark.	21½
9597	McGinty Spur, Ark.	20½
7965	Halley to	
8025	Arkla, Ark.	20½
10035	Gasoway Spur to	
10115	Mansford, La.	20½
10120	Tallulah, La.	20½
10130	Leclede to	
10220	Panola, La.	22½
10225	Concordia, La.	22½
10230	Ferriday, La.	22½
10285	Sycamore, La.	22½
10290	Minorca Spur, La.	22½
10295	Vidalia, La.	22½
10300	Kilbourne to	
10340	Epps, La.	22½
7955	McArthur to	
7790	Harbis, Ark.	22½
7785	Barton, Ark.	22½
7685	West Helena to	
7690	Helena, Ark.	22½
7695	Kendall to	
7725	Pine City, Ark.	23
7730	Holley Grove to	
7740	Clarendon, Ark.	23
7745	Raymond to	
7770	Alfrey Spur, Ark.	23
7775	Brinkley, Ark.	23
7680	Lexa to	
7675	LeGrange, Ark.	25
7610	Marianna to	
7590	Bonair, Ark.	25
7585	Forrest City, Ark.	24½
7580	Coldwell to	
7575	Colt, Ark.	24½
7570	Wynne, Ark.	24½
7615	Soudan to	
7660	Calet Spur, Ark.	26½
7665	Hulbert, Ark.	24½
8280	Moore Spur to	
8325	Morton, Ark.	23
8330	Fair Oaks, Ark.	23
8335	Hamlin to	
8410	Blanton, Ark.	24½
8030	Indian, Ark.	20½
7565	Vanndale to	
7515	Apt, Ark.	25
7510	Nettleton, Ark.	25
7505	Powell to	
7460	Sellmeyer, Ark.	26½

Shippers request the publication of rates from Harrys and Eagle Ford, Texas, on a more equitable basis when compared with rates from Cape Girardeau, Mo., and Kansas Gas Belt points.

Trunk Line Association Docket

12301. To increase the rate on crushed stone. Carloads, minimum weight 90% of marked capacity of car, except when car is loaded to cubical or visible capacity, actual weight will apply, from Dalmatia, Penn. (Susquehanna Stone Co.'s Siding Nos. 4 and 5), to Dalmatia, Penn., from 54 cents to 70 cents per 2000 lb.

12302. To increase the rate on cement, common, hydraulic, natural and portland, carloads, from Chapman, Evansville, Penn., Ironton R. R. stations and other points in the Lehigh District, to Lansdown, Penn., from 12 cents to 13 cents per 100 lb.

Western Trunk Line Docket

2251. Lime. Carloads, from Duluth and Superior, Wis., to stations on C. M. & St. P. Ry. in Iowa. Present and proposed rates to a few representative points are as follows in cents:

	Present	Proposed
Boone, Iowa	32½	22½
Yale, Iowa	32½	23
Lohrville, Iowa	32½	22½
Rockwell City, Iowa	33½	22½
Ottumwa, Iowa	32½	24
Moravia, Iowa	32½	24
Glen Ellyn, Iowa	33½	22½
Buck Grove, Iowa	33½	22½

Minimum weight 30,000 lb. (By shipper.)

Texas-Louisiana Tariff Bureau Docket

5989-TX. Lime. Carloads, rates on from Austin, Dittlinger, McNeil and Round Rock to Beaumont, Orange, Atreco, Magpetco, Pt. Arthur, Pt. Neches, etc. Proposition from carriers to cancel special rates on lime, carloads, from Austin, Dittlinger, McNeil and Round Rock to Beaumont-Port Arthur group points as shown in Items 7655 and 7660, Texas Lines' Trf. No. 2-I, allowing current mileage scale of rates to apply.

Western Trunk Line Docket

2382A. Refuse, lime. Carloads, from Mason City, Iowa, to interstate points in Minnesota. Present, class rates; proposed, to apply on interstate traffic the distance rates named in Iowa Lines' Tariff 160C, I. C. C. A1489. Minimum weight, 90% of marked capacity of car.

3952A. Stone, crushed. Carloads, from Sioux Falls, S. D., to St. Louis, Mo. Present, 13½ cents per 100 lb.; proposed, 14 cents per 100 lb. Minimum weight 90% of marked capacity of car, except when actual weight of shipment loaded to full visible capacity of car is less than 90% of marked capacity of car, the actual weight will be the minimum weight. In no case shall the minimum weight be less than 40,000 lb.

2957A. Sand and gravel. Carloads, from Muscatine, Iowa, to Lincoln, Neb. Present, 21 cents per 100 lb. (Class E); proposed, 14½ cents per 100 lb. Minimum weight 90% of marked capacity of car, except when weight of shipment loaded to full visible capacity of car is less than 90% of the marked capacity of car, the actual weight will apply. In no case shall the minimum weight be less than 40,000 lb.

The Rock Products Market

Wholesale Prices of Crushed Stone

Prices given are per ton, F. O. B., at producing plant or nearest shipping point

Crushed Limestone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:			1.30 per net ton all sizes			
Buffalo, N. Y.						
Chaumont, N. Y.	1.00	.....	1.75	1.50	1.50	1.50
Cobleskill, N. Y.	1.25	1.25	1.25	1.25	1.25	.....
Coldwater, N. Y.			1.50 per net ton all sizes			
Columbia, Ill.	1.10	1.20	1.35	1.35	1.20	1.20
Eastern Pennsylvania	1.35	1.35	1.45	1.35	1.35	1.35
Munns, N. Y.	1.00	1.40	1.40	1.30	.....	.....
Northern New Jersey	.....	.....	1.60	.....	.....	.....
Prospect, N. Y.	1.00	1.40	1.40	1.30	1.30	.....
Walford, Penn.	.....	1.30b	1.30b	1.40b	1.40b	1.60c
Watertown, N. Y.	1.00	.....	1.75	1.50	1.50	1.50
Western New York	.85	1.25	1.25	1.25	1.25	1.25
CENTRAL						
Alton, Ill.	1.50	.....	1.50	1.25	.....	.....
Bloomville, Middlepoint, Dunkirk, Bellevue, Waterville, No. Baltimore, Holland, Kenton, New Paris, Ohio; Monroe, Mich.; Huntington, Bluffton, Ind.	1.00	1.10	1.10	1.10	1.00	1.00
Buffalo, Iowa	.90	.....	1.25	1.05	1.10	1.10
Chicago, Ill.	.80	1.00	1.00	1.00	1.00	1.00
Cypress, Ill.	1.25	1.30	1.25	1.25	1.25	1.15
Dundas, Ont.	.75	1.00	1.00	.90	.90	.90
Greencastle, Ind.	1.25	1.25	1.15	1.05	1.05	1.05
Lannon, Wis.	.80	1.00	1.00	.90	.90	.90
Linwood, Iowa	1.00	1.25	1.25	1.05	1.05	1.15
Northern Wisconsin	.75	.....	1.05	.95	.95	.....
St. Vincent de Paul, P. Q.	.75	1.25@1.45	1.10	1.00	1.00	1.00
Stone City, Iowa	.75	.....	.....	1.10@1.20	1.05	.....
Toronto, Canada	2.00‡	2.00‡	2.00‡	1.80‡	1.80‡	1.80‡
Valmeyer, Ill.	1.10	1.20	1.35	1.35	1.20	1.20
Waukesha, Wis.	1.10	1.10	1.10	1.10	1.10	1.10
Youngstown, Ohio	.....	.....	.....	1.50	1.60	1.60
SOUTHERN:						
Alderson, W. Va.	.60	1.60	1.60	1.50	1.40	.....
Bridgeport, Texas	1.50	1.35	1.25	1.25	1.20	1.15
Cartersville, Ga.	1.50	1.65	1.65	1.35	1.35	1.35
El Paso, Texas	1.00	1.00	1.00	1.00	1.00	.....
Ft. Springs, W. Va.	.60	1.60	1.60	1.50	1.40	.....
Graystone, Ala.			Crusher run screened, 1.00 per net ton			
Graysville, Ga.	1.00@1.25	1.00@1.25	.....	.85@1.25	.85@1.25	.....
WESTERN:						
Atchison, Kans.	.50	2.00	2.00	2.00	2.00	1.60‖@1.80
Blue Spr'gs & Wymore, Neb.	.10	1.45	1.45	1.35@1.40	1.25@1.30	1.20
Cape Girardeau, Mo.	1.25	.....	1.25	1.25	1.00	.....
Kansas City, Mo.	1.00	1.65	1.65	1.65	1.65	1.65

Crushed Trap Rock

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Branford, Conn.	.60	1.60	1.35	1.15	1.00	.....
Cypress, Ill.	1.00@1.10	.....	.....	.....	.....	.....
Duluth, Minn.	1.00	2.25	1.75	1.50	1.30	1.30
Dwight, Calif.	1.75	1.75	1.75	1.75	1.75	.....
Eastern Maryland	1.10	1.75	1.70	1.60	1.50	1.50
Eastern Massachusetts	.85	1.75	1.75	1.25	1.25	1.25
Eastern New York	.75	1.25	1.25	1.25	1.25	1.25
Eastern Pennsylvania	1.10	1.75	1.70	1.60	1.50	1.50
Minneapolis, Minn.	1.25	.....	2.25	2.00	1.75	.....
New Haven, Conn.	.60	1.60@1.75	1.35@1.50	1.15@1.30	1.00@1.10	.....
Northern New Jersey	1.40@1.50	1.40@2.00	1.80	1.40	1.40	.....
Oakland and El Cerrito, Calif.	1.75	1.75	1.75	1.75	1.75	.....
Richmond, Calif.	1.00*	.....	1.50*	1.50*	1.50*	.....
Springfield, N. J.	2.00	2.00	2.00	1.70	1.60	1.50
San Diego, Calif.	.50@ .75	1.80@1.90	1.60@1.80	1.35@1.55	1.35@1.55	1.25@1.45
Westfield, Mass.	.60	1.50	1.35	1.20	1.10	.....

Miscellaneous Crushed Stone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Berlin, Utley and Red Granite, Wis.	1.60	1.70	1.60	1.50	1.40	.....
Eastern Penn.—Sandstone	1.25	1.65	1.60	1.40	1.40	1.25
Eastern Penn.—Quartzite	1.20	1.35	1.20	1.20	1.20	1.20
Lithonia, Ga.—Granite	.75	.....	1.50	1.25	1.25	.....
Lohrville, Wis.	1.65	1.65@1.70	1.65	1.45	1.50	.....
Middlebrook, Mo.—Granite	3.00@3.50	.....	2.00@2.25	2.00@2.25	2.00@2.25	1.25@2.00
Northern New Jersey (Basalt)	150	2.00	1.80	1.40	1.40	.....

*Cubic yd. †1 in. and less. ‡Prices include 90c freight. ‖Rip rap per ton. (b) Less 5c 10 days; (c) less 10c 10 days (2¾" to 5⅛").

Agricultural Limestone

(Pulverized)

Alton, Ill. — Analysis, 98% $CaCO_3$; 90% thru 100 mesh 6.50

Asheville, N. C. — Analysis, 57% $CaCO_3$, 39% $MgCO_3$; 50% thru 100 mesh; 200-lb. burlap bag, 4.00; bulk 2.75

Branchton, Penn. — 100% thru 20 mesh; 60% thru 100 mesh; 45% thru 200 mesh. (Less 50 cents commission to dealers) 5.00

Bridgeport and Chico, Texas; bulk 5.50

Cartersville, Ga. — Analysis, 56% $CaCO_3$, 42% $MgCO_3$; pulverized 2.25
100% thru 10 mesh 1.50

Chaumont, N. Y. — Pulverized limestone, bags, 4.00; bulk 2.50

Colton, Calif.—Analysis, 95% $CaCO_3$, 3% $MgCO_3$—all thru 20 mesh—bulk 4.00

Dundas, Ont., Can.—Analysis, 53.80% $CaCO_3$, 43.31% $MgCO_3$; 35% thru 100 mesh, 50% thru 50 mesh, 100% thru 10 mesh; bags, 4.75; bulk 3.00

Hillsville, Penn. — Analysis, 94% $CaCO_3$, 1.40% $MgCO_3$, 75% thru 100 mesh; sacks, $5.00; bulk 3.50

Jamesville, N. Y.—Analysis, 89.25% $CaCO_3$; 5.25% $MgCO_3$; pulverized, bags, 4.00; bulk 2.50

Knoxville, Tenn.—80% thru 100 mesh, bags, 3.95; bulk 2.70

Linville Falls, N. C.—Analysis, 57% $CaCO_3$, 39% $MgCO_3$; 50% thru 100 mesh; 200-lb. burlap bag, 4.00; bulk 2.75

Marblehead, Ohio — Analysis, 83.54% $CaCO_3$, 14.92% $MgCO_3$; 60% thru 100 mesh; 70% thru 50 mesh; 100% thru 10 mesh; 80 lb. paper sacks, 5.00; bulk 3.50

Marion, Va. — Analysis, 90% $CaCO_3$, 2% $MgCO_3$; 42.5% thru 100 mesh, 11.3% thru 80, 20.2% thru 60, 22.8% thru 40, 3.2% thru 20 and under or 75% thru 40 mesh; pulverized, per ton 2.00

Mayville Wis.—59.8% thru 60 mesh 2.35

Mountville, Va.—Analysis 76.60% $CaCO_3$, 22.83% $MgCO_3$; 50% thru 100 mesh, 100% thru 20 mesh—125-lb. hemp bags 5.00

Osborne, Penn.—100% thru 20 mesh; 60% thru 100 mesh; 45% thru 200 mesh. (Less 50 cents commission to dealers) 5.00

Piqua, Ohio—Total neutralizing power 95.3%; 100% thru 10, 60% thru 50; 50% thru 100 ..... 2.10@ 2.25
100% thru 10, 90% thru 50, 80% thru 100; bags, 5.00; bulk 3.50
100% thru 100, 85% thru 200; bags, 7.00; bulk 5.50

Rockdale, Mass. — Analysis, 90% $CaCO_3$—50% thru 100 mesh; paper bags, 4.75; cloth, 5.25; bulk 3.25

Watertown, N. Y.—Analysis, 96-98% $CaCO_3$, pulverized limestone, bags, 4.00; bulk 2.00

West Stockbridge, Mass. — Analysis, 90% $CaCO_3$—50% thru 100 mesh; paper bags, 4.75; cloth, 5.25; bulk 3.25

Agricultural Limestone

(Crushed)

Alderson, W. Va. — Analysis, 90% $CaCO_3$; 50% thru 100 mesh 1.50

Alton, Ill.—Analysis 98% $CACO_3$; 50% thru 4 mesh 3.50

Bedford, Ind.—Analysis, 98½% $CACO_3$, ½% $MgCO_3$; 90% thru 10 mesh 1.50

Bettendorf, Iowa — 97% $CaCO_3$, 2% $MgCO_3$; 50% thru 100 mesh; 50% thru 4 mesh 1.50

Blackwater, Mo.—98% $CaCO_3$; 100% thru 8 mesh 1.00

Bridgeport, Texas — Analysis, 94% $CaCO_3$, 2% $MgCO_3$; 50% thru 50 mesh; 90% thru 4 mesh. Fines one-half dust 1.50

Cape Girardeau, Mo.—Analysis, 93.5% $CaCO_3$, 3.5% $MgCO_3$; 90% thru 50 mesh 1.50

(Continued on next page)

Agricultural Limestone

(Continued from preceding page)

Chicago, Ill.—50% thru 100 mesh; 90% thru 4 mesh	.80
Cypress, Ill. — Analysis, 90 to 96% $CaCO_3$; 50% thru 100 mesh, 90% thru 50 mesh, 50% thru 50 mesh	1.90
Ft. Springs, W. Va.—Analysis, 90% $CaCO_3$; 90% thru 50 mesh	1.50
Kansas City, Mo.—50% thru 100 mesh	1.25
Lannon, Wis.—Analysis, 54% $CaCO_3$, 44% $MgCO_3$; 99% through 10 mesh; 46% through 60 mesh	2.00
Screenings (¼ in. to dust)	1.00
Marblehead, Ohio.—Analysis, 83.54% $CaCO_3$, 14.92% $MgCO_3$; 100% thru 4 mesh; 85% thru 10 mesh; 53% thru 50 mesh; 40% thru 100 mesh bulk	2.60
32% thru 100 mesh; 51% thru 50 mesh; 83% thru 10 mesh; 100% thru 4 mesh (meal) bulk	2.25
Middlepoint, Bellevue, Kenton, Ohio; Monroe, Mich.; Huntington and Bluffton, Ind. — Analysis, 52% $CaCO_3$, 44% $MgCO_3$; meal, 100% thru 4 mesh, 35% thru 100 mesh	.75@ 1.50
Milltown, Ind. — Analysis, 94.41% $CACO_3$, 2.95% $MgCO_3$; 30.8% thru 100 mesh .38% thru 50 mesh	1.45@ 1.60
Moline, Ill.—97% $CaCO_3$, 2% $MgCO_3$ —50% thru 100 mesh; 50% thru 4 mesh	1.50
Pixley, Mo.—Analysis, 96% $CACO_3$; 50% thru 50 mesh	1.25
50% thru 100 mesh; 90% thru 50 mesh; 50% thru 50 mesh; 90% thru 4 mesh; 50% thru 4 mesh	1.65
River Rouge, Mich.—Analysis, 54% $CaCO_3$, 40% $MgCO_3$; bulk	.80@ 1.40
Stone City, Iowa. — Analysis, 98% $CaCO_3$; 50% thru 50 mesh	.75

Pulverized Limestone for Coal Operators

Hillsville, Penn., sacks, 4.50; bulk	3.00

Miscellaneous Sands

Silica sand is quoted washed, dried and screened unless otherwise stated. Prices per ton.

Glass Sand:	
Berkeley Springs, W. Va.	2.25@ 2.50
Cedarville and S. Vineland, N. J.—Damp	1.75
Dry	2.25
Cheshire, Mass: 6.00 to 7.00 per ton; bbl.	2.50
Columbus, Ohio	1.25@ 1.50
Estill Springs and Sewanee, Tenn.	1.50
Grays Summit and Klondike, Mo.	2.00
Mapleton Depot, Penn.	2.00@ 2.25
Massillon, Ohio	3.00
Millville, N. J.—Green bottle sand	1.75@ 2.25
Ohlton, Ohio	2.50
Oceanside, Calif.	3.00@ 3.40
Pacific, Mo.	2.25@ 3.00
Pittsburgh, Penn.—Dry	4.00
Damp	3.00
Red Wing, Minn.: Bank run	1.50
Ridgway, Penn.	2.50
Rockwood, Mich.	2.75@ 3.25
Round Top, Md.	2.00@ 2.25
San Francisco, Calif.	3.00@ 3.50
St. Louis, Mo.	1.50@ 3.00
Thayers, Penn.	2.50
Utica, Ill.	1.25
Zanesville, Ohio	2.50
Miscellaneous Sands:	
Aetna, Ind.: Core, Box cars, net, .35; open-top cars	.30
Albany, N. Y.: Core	1.50
Molding fine, brass molding	2.25
Molding coarse	2.00
Sand blast	4.00
Arenzville, Ill.: Core	.75
Molding fine	1.40@ 1.60
Brass molding	1.75
Beach City, Ohio: Fine core, washed and screened	1.50
Furnace bottom; steel molding (fine and coarse) washed and screened	2.00
Traction	1.75
Cheshire, Mass.—Furnace lining, molding fine and coarse	5.00
Sand blast	5.00@ 8.00
Stone sawing	6.00

(Continued on next page)

Wholesale Prices of Sand and Gravel

Prices given are per ton, f. o. b. producing plant or nearest shipping point

Washed Sand and Gravel

City or shipping point	Fine Sand, 1/10 in. down	Sand, ¼ in. and less	Gravel, ½ in. and less	Gravel, 1 in. and less	Gravel, 1½ in. and less	Gravel, 2 in. and less
EASTERN:						
Attica, N. Y.	.75	.75	.85	.75	.75	.75
Buffalo, N. Y.	1.10	.95			.85	
Erie, Penn.		1.00		1.25	1.50	
Farmingdale, N. J.	.58	.48	.85	1.30	1.10	
Franklinville, N. Y.	.75	.75	.85	.75	.75	.75
Leeds Jct., Maine		.50	1.75		1.35	1.25
Machias, N. Y.	.85	.85	.75	.75	.75	.75
Montoursville, Penn.	1.00	1.10	1.00	1.00	1.00	.90
Northern New Jersey	.40@ .50	.40@ .50		1.25	1.25	1.25
Pittsburgh, Penn., and vicinity		1.25	1.25	.85	.85	.85
Shining Point, Penn.			1.00	1.00	1.00	1.00
Washington, D. C.—Rewashed, river	.85	.85	1.70	1.50	1.30	1.30
CENTRAL:						
Attica, Ind.	.75	.75	.75	.75	.75	.75
Barton, Wis.		.22@ .40	.20@ .40	.20@ .40	.32@ .40	
Columbus, Ohio	.75	.75@1.00	.75@1.00	.75@1.00	.75@1.00	.75
Covington, Ind.	.75	.75	.75	.75	.75	.75
Des Moines, Iowa	.50	.30	1.50	1.50	1.50	1.50
Eau Claire, Wis.	.40	.40	.85@1.25			.85
Elkhart Lake, Wis.	.60	.40	.40	.60	.50	.50
Ft. Dodge, Iowa	1.00		2.05	2.05	2.05	
Ft. Worth, Texas	2.00	2.00	2.00	2.00	2.00	2.00
Grand Rapids, Mich.		.50		.80	.70	.70
Hamilton, Ohio		1.00	1.00§		1.00	
Hersey, Mich.		.50				.70
Indianapolis, Ind.	.60	.60		.90	.75@1.00	.75@1.00
Janesville, Wis.		.65@ .75			.65@ .75	
Mason City, Iowa	.45@ .55	.45@ .55	1.35@1.45	1.45@1.55	1.40@1.50	1.35@1.45
Mankato, Minn.		.50	1.35	1.35	1.35	
Milwaukee, Wis.	1.01	1.01	1.21	1.21	1.21	1.21
Minneapolis, Minn.*	.65	2.50†	2.00§		2.00	1.75
Moline, Ill.	.60	.60	1.20	1.20	1.20	1.20
Palestine, Ill.	.75	.75	.75	.75	.75	.75
St. Louis, Mo., f. o. b. cars	1.18	1.45	1.65§	1.45		1.45‖
Silverwood, Ind.	.75	.75	.75	.75	.75	.75
Summit Grove, Ind.	.75	.75	.75	.75	.75	.75
Terre Haute, Ind.	.75	.60	.75	.75	.75	.75
Wolcottville, Ind.	.75	.75	.75	.75	.75	.75
Waukesha, Wis.	.55	.55	.75	.75	.75	.75
Winona, Minn.	.40	.40	1.25	1.10	1.00	1.00
Yorkville, Sheridan, Oregon, Moronts, Ill.			Average .40@.60			
Zanesville, Ohio	.70	.60	.60		.90	
SOUTHERN:						
Brookhaven, Miss., Roseland La.	.70	.70	2.25	1.50	1.25	
Charleston, W. Va.	all sand 1.37 f.o.b. cars		all gravel 1.47 f.o.b. cars			
Chehaw, Ala.	1.24	1.24		1.90	1.90	1.90
Estill Sp'gs & Sewanee, Tenn.	1.00	.90	1.00	1.00		.85
Knoxville, Tenn.	1.00	1.00	1.20	1.20	1.20	1.20
Macon, Ga.	.50	.50		.65	.65	.65
New Martinsville, W. Va.	1.00	.90		1.30		.90
WESTERN:						
Baldwin Park, Calif.		.25@ .35			.50@ .75	
Crushed rock	.90@1.10	.60@ .90	.60@ .90	.60@ .90	.60@ .90	
Kansas City, Mo.			Kaw river sand .75 per ton f.o.b. plants			
Los Angeles, Calif.		.40	.50	.65	.60	.60
Pueblo, Colo.	1.10*	.90*		1.75*		1.60*
San Diego, Calif.	50@ .65	.80@ .90	1.40@1.50	1.20@1.30	1.00@1.10	1.00@1.10
Seattle, Wash. (bunkers)	1.50*	1.50*	1.50*		1.50*	1.50*

Bank Run Sand and Gravel

City or shipping point	Fine Sand, 1/10 in. down	Sand, ¼ in. and less	Gravel ½ in. and less	Gravel, 1 in. and less	Gravel, 1½ in. and less	Gravel, 2 in. and less
Boonville, N. Y.	.60@ .80		.55@ .75			1.00
Brookhaven, Miss., Rosel'd, La.			Road gravel, ballast gravel .60 a ton			
Chehaw, Ala.	.90@1.00					
Des Moines, Iowa			Washed, .50; unwashed, .40 (not screened)			
Dudley, Ky.‡	1.05	1.05		.95		
East Hartford, Conn.			Sand, .65 per cu. yd.			
Elkhart Lake, Wis.	.50					
Gainesville, Texas		.95				.55
Grand Rapids, Mich.				.55		
Hamilton, Ohio					.67	
Hersey, Mich.				.55		
Indianapolis, Ind.			Mixed gravel for concrete work, .65			
Lindsay, Texas				.55		
Macon, Ga.	.40					
Mankato, Minn.			Pit run gravel, .60			
Moline, Ill. (b)	.60	.60	Concrete gravel, 50% G., 30% S., 1.00			
Montezuma, Ind.						.60
St. Louis, Mo.			Mine run gravel 1.55 per ton			
Shining Point, Penn.			Concrete sand, 1.10 ton			
Summit Grove, Ind.	.50	.50	.50	.50	.50	.50
Waukesha, Wis.	.60	.60	.60	.60	.60	.60
Winona, Minn.	.60	.60	.60	.60	.60	.60
York, Penn.	1.00	1.00				
Zanesville, Ohio		.60				

*Cubic yd.; †roofing gravel; §⅝ in. and less; ‡crushed silica; ‖2½ in. and less; (a) ¾ in. and less; (b) river run.

Miscellaneous Sands

(Continued from preceding page)

Columbus, Ohio:		
Core	.25@	.30
Furnace lining		2.50
Molding fine		2.00
Molding coarse	1.50@	2.00
Sand blast	3.00@	4.00
Stone sawing		1.50
Traction	.30@	.65
Brass molding	2.00@	2.50
Dunbar, Penn.:		
Traction (damp)		2.00
Eau Claire, Wis.:		
Sand blast	3.00@	3.25
Elco, Ill.:		
Ground silica per ton in carloads	20.00@	31.00
Estill Springs and Sewanee, Tenn:		
Molding fine and coarse, brass molding		1.25
Roofing sand, sand blast, traction		1.50
Franklin, Penn.:		
Core		2.00
Molding coarse and fine		1.75
Grays Summit, Mo.:		
Molding fine	1.75@	2.00
Joliet, Ill.:		
No. 2 molding sand; also loam for luting purposes and open-hearth work	.65@	.85
Klondike, Mo.:		
Molding fine	1.75@	2.00
Mapleton Depot, Penn.:		
Molding fine		2.25
Molding coarse		2.10
Massillon, Ohio:		
Molding fine, coarse, furnace lining core, and stone sawing		2.50
Traction		2.25
Montoursville, Penn.:		
Core	1.25@	1.35
Traction	1.00@	1.10
Brass molding		1.50
New Lexington, Ohio:		
Molding fine		2.00
Molding coarse		1.50
Ohlton, Ohio:		
Core, furnace lining, molding fine and coarse, all green	1.75@	1.90
Roofing sand, sand blast, stone sawing, traction, all green		1.75
Add 50c a ton for green sand dried.		
Oceanside, Calif.:		
Roofing sand (stucco)	3.00@	3.40
Ottawa, Ill.:		
Crude silica sand	.75@	1.00
Pacific, Mo.:		
Core, furnace lining	1.00@	1.25
Molding fine	.90@	1.00
Stone sawing	1.00@	1.75
Molding coarse	.85@	1.00
Red Wing, Minn.:		
Core, furnace lining, stone sawing		1.50
Molding fine and coarse, traction		1.25
Sand blast		3.50
Filter sand		3.75
Ridgway, Penn.:		
Core		2.00
Furnace lining, molding fine, molding coarse		1.25
Traction		2.25
Round Top, Md.:		
Core, molding fine		1.60
Traction		1.75
St. Louis, Mo.:		
Core	1.00@	1.75
Furnace lining		1.50
Molding fine	1.50@	2.50
Molding coarse	1.25@	1.75

Crushed Slag

City or shipping point		¼ in.	½ in.	¾ in.	1½ in.	2½ in.	3 in.
EASTERN:	Roofing	down	and less	and less	and less	and less	and larger
Buffalo, N. Y.	2.25	1.25	1.25	1.25	1.25	1.25	1.25
E. Canaan, Conn.	3.00	1.00	2.25	1.25	1.25	1.15	1.15
Eastern Penn. and Northern N. J.	2.50	1.20	1.50	1.20	1.20	1.20	1.20
Reading, Pa.	2.50	1.00	2.50	1.25			
Western Penn.	2.50	1.25	1.50	1.25	1.25	1.25	1.25
CENTRAL:							
Ironton, Ohio	2.05	1.05		1.45		1.45	
Jackson, Ohio		1.05		1.30	1.05	1.30	
Toledo, Ohio	1.50	1.25	1.25	1.25	1.25	1.25	1.25
Youngstown, Dover, Hubbard, Leetonia, Struthers, O.	2.00	1.25	1.35	1.35	1.25	1.25	1.25
SOUTHERN:							
Ashland, Ky.		1.55		1.55	1.55	1.55	
Ensley and Alabama City, Ala.	2.05	.80	1.25	1.15	.90	.90	.80
Longdale, Goshen, Glen Wilton, Roanoke, Ruesens, Va.	2.54	1.00	1.25	1.25	1.25	1.15	1.15

Lime Products (Carload Prices Per Ton F.O.B. Shipping Point)

	Finishing hydrate	Masons' hydrate	Agricultural hydrate	Chemical hydrate	Ground burnt lime, Blk.	Ground burnt lime, Bags	Lump lime, Blk.	Lump lime, Bbl.
EASTERN:								
Berkeley, R. I.			12.00					2.30
Buffalo, N. Y.				12.00				
Lime Ridge, Penn.							5.00a	
West Stockbridge, Mass.		10.50	6.00l					3.25m
Williamsport, Penn.			10.00				6.00	
York, Penn.		10.50	10.50	11.50			8.50	1.65i
CENTRAL:								
Cold Springs, Ohio		9.00	9.00		9.00	11.00	9.00	
Delaware, Ohio	12.50	9.00	8.00	10.00			9.00	1.60
Gibsonburg, Ohio	12.50				9.00	11.00		
Huntington, Ind.	12.50	9.50	9.50		9.00		8.50	1.50c
Luckey, Ohio (f)	12.50							
Marblehead, Ohio		9.50	9.50				8.50	1.50c
Marion, Ohio		9.50	9.50				8.50	1.70j
Mitchell, Ind.		12.00	12.00	12.00	11.00		10.00	1.70e
Tiffin, Ohio					9.00			
White Rock, Ohio	12.50				9.00	11.00		
Woodville, Ohio	12.50†	9.50†	8.50†	12.50†	9.00	10.50	9.00	1.60
SOUTHERN:								
Erin, Tenn.							8.50	1.40*
El Paso, Texas							9.00	
Graystone, Ala.	12.50	11.00		8.50@10.00			8.50	1.50k
Karo, Va.		10.50	9.00				7.00g	1.65h
Knoxville, Tenn.	12.50	11.00		11.00		1.35	8.50	1.50
Staunton, Va. (boss lime)								1.30
Varnons, Ala. (f)	11.00	11.00			9.50		8.50	15.00
Zuber and Ocala, Fla.	14.00	12.00	10.00				12.00	1.70
WESTERN:								
Kirtland, N. M.							12.50h	
San Francisco, Calif.	22.00	22.00	15.00	22.00			2.00n	
Tehachapi, Calif.							13.00	2.00d

*And 1.50; †50-lb. paper bags; (a) run of kilns; (c) wooden, steel 1.70; (d) wood; (e) wood bbl., $2.20 drum in steel; (f) dealers' prices; (g) to 9.50; (h) to 1.75; (i) 200 lb. bbl.; 2.65, 300 lb. bbl.; (j) steel; (k) 180 lb. bbl., 1.35; (l) bags; (m) finishing lime, 2.50 common; (n) low grade; 2.50, high calcium.

Miscellaneous Sands

(Continued)

Roofing sand		1.75
Sand blast	3.50@	4.50
Stone sawing	1.25@	2.25
Traction		1.25
Brass molding	2.00@	3.00
San Francisco, Calif.:		
(Washed and dried)—Core, molding fine, roofing sand and brass molding	3.00@	3.50
San Francisco, Calif. (Direct from Pit)		
Furnace lining, molding coarse, sand blast		3.60
Stone sawing, traction		2.30
Tamalco, Ill.:		
Molding coarse	1.40@	1.60
Brass molding		1.75
Tamms, Ill.:		
Ground silica per ton in carloads	20.00@	31.00
Thayers, Penn.:		
Core		2.00
Molding fine and coarse		1.25
Traction		2.25
Utica, Ill.:		
Core, molding coarse		.75
Stone sawing, furnace lining		1.00
Molding fine		.65
Utica, Penn.:		
Core, molding fine, brass molding		2.00
Molding coarse	1.50@	1.75
Warwick, Ohio.:		
Core, molding fine (green) 1.75; dry		2.50
Furnace lining		2.50
Zanesville, Ohio:		
Sand blast, core, traction		2.50
Furnace lining		2.25
Molding fine and coarse; brass molding	1.50@	1.75

Talc

Prices given are per ton f.o.b. (in carload lots only), producing plant, or nearest shipping point.

Chatsworth, Ga.:		
Crude—f.o.b. cars		5.00
Ground (150-200 mesh), bags		12.00
Pencils and steel workers' crayons, per gross		1.50
Chester, Vt.:		
Ground (20-70 mesh)	7.00@	8.00
Ground (150-200 mesh)	8.00@	10.00
(Bags extra, returnable)		
E. Granville, Rochester, Johnson, Waterbury, Vt.:		
Ground talc (20-50 mesh) bags	7.00@	10.00
Ground talc (150-200 mesh) bags	10.00@	25.00
Pencils and steel workers' crayons, per gross	.75@	2.00
Emeryville, N. Y.:		
(Double air floated) including bags; 325 mesh, C.L., 14.75; L.C.L.		15.25
Hailesboro, N. Y.:		
Ground (150-200 mesh) bags		18.00
Henry, Va.:		
Crude talc (mine run) per 2000-lb. ton	2.75@	3.50
Ground (150-200 mesh), bags	8.50@	14.00
Joliet, Ill.		
Ground (200 mesh) bags	30.00@	35.00
Keeler, Calif.:		
(150-200 mesh); carloads, 30 tons or more (bags extra)	20.00@	30.00
Marshall, N. C.:		
Crude	4.00@	8.00
Ground (20-50 mesh), bags extra	6.50@	8.50
Ground (150-200 mesh), bags	8.00@	12.00
Natural Bridge, N. Y.:		
Ground talc (300-325 mesh), 200-lb. bags	13.00@	15.00

Rock Phosphate

Prices given are per ton (2240-lb.) f.o.b. producing plant or nearest shipping point.

Lump Rock

Centerville, Tenn.—B.P.L. 65%, bags		8.50
Bulk		6.50
Gordonsburg, Tenn.—B.P.L. 68-72%	4.00@	4.50
Mt. Pleasant, Tenn.—B.P.L. 72%	5.50@	6.00
13% phosphoric acid, 95% thru 80 mesh		5.75
75% hand mined	6.50@	6.75
75% washed over ¼-in. screen		6.75
75% max. 5½% I and A	6.50@	7.00
78% max. 4½% I and A		8.00
Tennessee—F. O. B. mines, gross ton, unground Tenn. brown rock, 72% min. B.P.L.		5.50
Twomey, Tenn.—B.P.L. 65%, 2000 lb.	7.00@	8.00

Ground Rock

(2000 lb.)

Mt. Pleasant, Tenn.—B.P.L. 65%	7.00@	8.00
Twomey, Tenn.—B.P.L. 65%	7.00@	8.00

(Continued on next page)

Roofing Slate

The following prices are per square (100 sq. ft.) for Pennsylvania Blue-Clay Roofing Slate, f. o. b. cars quarries:

Sizes	Genuine Bangor, Washington Big Bed, Franklin Big Bed	Genuine Albion	Slatington Small Bed	Genuine Bangor Ribbon
24x12, 24x14	10.20	10.00	8.10	7.80
22x12	10.80	10.00	8.40	8.75
22x11	10.80	10.50	8.40	8.75
20x12	12.60	10.50	8.70	8.75
20x10, 18x10, 18x9, 18x12	12.60	11.00	8.70	8.75
16x10, 16x9, 16x8, 16x12	12.60	11.00	8.40	8.75
14x10	11.10	11.00	8.10	7.80
14x8	11.10	10.50	8.10	7.80
14x7 to 12x6	9.30	10.50	7.50	7.80
	Mediums	Mediums	Mediums	Mediums
24x12	$ 8.10	$8.10	$7.20	$5.75
22x11	8.40	8.40	7.50	5.75
Other sizes	8.70	8.70	7.80	5.75

For less than carload lots of 20 squares or under, 10% additional charge will be made.

(Continued from preceding page)

Florida Soft Phosphate

(Raw Land Pebble)

Per Ton

Florida—F. O. B. mines, gross ton, 68/66% B.P.L., Basis 68%	2.25
70% min. B.P.L., Basis 70%	2.50
72% min. B.P.L., Basis 72%	2.75
75/74% B.P.L., Basis 75%	3.75

Fluorspar

Fluorspar—80% and over calcium fluoride, not over 5% silica; per ton f.o.b. Illinois and Kentucky mines	18.00
Fluorspar—85% and over calcium fluoride, not over 5% silica; per ton f.o.b. Illinois and Kentucky mines	19.50

Special Aggregates

Prices are per ton f. o. b. quarry or nearest shipping point.

City or shipping point	Terrazzo	Stucco chips
Barton, Wis., f.o.b. cars		10.50
Chicago, Ill.—Stucco chips, in sacks f.o.b. quarries		17.50
Crown Point, N. Y.—Mica Spar		7.00@ 8.00
Easton, Penn.—Royal green, evergreen, creme, sylvan		10.00@18.00
Grit sizes		3.00@ 5.00
Haddam, Conn.—Felstone buff	12.00	12.00
Harrisonburg, Va.—Blk marble (crushed. in bags	12.50	12.50
Ingomar, Ohio (in bags)		6.00@20.00
Middlebrook, Mo.—Red		20.00@25.00
Milwaukee, Wis.		14.00@34.00
Newark, N. J.—Roofing granules		7.50
New York, N. Y.—Red and yellow Verona		32.00
Poultney, Vt., 2000 lb.		6.12
Phillipsburg, N. J.—Evergreen, bulk	8.00@10.00	8.00@10.00
Creme and royal, bulk	15.00@20.00	15.00@20.00
Red Granite, Wis.		7.50
Sioux Falls, S. D.	7.50	7.50
Stockton, Cal.—Quartz sized roofing, per ton, in sacks		13.50
Tuckahoe, N. Y.—2000 lb.		12.00@20.00
Wauwatosa, Wis.		20.00@34.00
Whitestone, Ga.—White marble chips, net ton in bulk, f.o.b. cars, granite	4.50@ 6.00	4.50@ 6.00

Concrete Brick

Prices given per 1000 brick, f.o.b. plant or nearest shipping point.

	Common	Face
Appleton, Minn.	22.00	
Baltimore, Md. (Del. according to quantity)	16.00@17.00	22.00@50.00
Ensley, Ala. ("Slagtex")	12.50	22.50@33.50
Eugene, Ore.	25.00	35.00@75.00
Friesland, Wis.	22.00	32.00
Omaha, Neb.	18.00	30.00@40.00
Philadelphia, Penn.	15.25	21.00
Prairie du Chien, Wis.	14.00	21.50@30.00
Puyallup, Wash.	20.00	30.00@90.00
Rapid City, S. D.	18.00	25.00@45.00
Watertown, N. Y.	21.00	35.00
Wauwatosa, Wis.	14.00@18.00	30.00@42.00

Sand-Lime Brick

Prices given per 1000 brick f. o. b. plant or nearest shipping point, unless otherwise noted.

Barton, Wis.	10.00
Boston, Mass.	14.00@15.50
Dayton, Ohio	12.50@13.50
Grand Rapids, Mich. (wholesale)	9.00
Jackson, Mich.	13.00
Lancaster, N. Y.	13.50
Michigan City, Ind.	11.00
Milwaukee, Wis.	13.00
Plant City, Fla.	10.00@11.00
Portage, Wis.	15.00
Rochester, N. Y. (delivered)	19.75
Saginaw, Mich.	12.00
San Antonio, Texas	12.50@14.00
Syracuse, N. Y.	18.00

Gray Klinker Brick

El Paso, Texas	13.00

Lime

Warehouse prices, carload lots at principal cities.

	Hydrated, Finishing	per ton Common
Atlanta, Ga.	22.50	14.00
Baltimore, Md.	24.25	17.85
Boston, Mass.	20.50	15.50
Cincinnati, Ohio	16.80	14.30
Chicago, Ill.	20.00	18.00
Dallas, Tex.	20.00	
Denver, Colo.	24.00	
Detroit, Mich.	22.00	20.00
Minneapolis, Minn. (white)	25.50	21.00
Montreal, Que.		21.00
New York, N. Y.	18.20	13.10
Philadelphia, Penn.	23.00	16.00
St. Louis, Mo.	24.00	20.00
San Francisco, Calif.	22.60	
Seattle, Wash. (paper sacks)	24.00	

Portland Cement

Prices per bag and per bbl. without bags net in carload lots.

	Per Bag	Per Bbl.
Albany, N. Y.		2.62
Atlanta, Ga.		2.35
Boston, Mass.		2.53@3.03†
Buffalo, N. Y.		2.38@2.88†
Cedar Rapids, Iowa	.61	2.44
Cincinnati, Ohio	.61¼	2.47
Cleveland, Ohio	.59¼	2.39
Chicago, Ill.	.55	2.20
Columbus, Ohio		2.44
Dallas, Texas	.53¾	2.15
Davenport, Iowa	.59¾	2.39
Dayton, Ohio		2.48
Denver, Colo.	.63¾	2.55
Detroit, Mich.	.60	2.40
Duluth, Minn.	.54¾	2.19
Indianapolis, Ind.	.60¼	2.41
Kansas City, Mo.	.54¼	2.47
Los Angeles, Cal. (less 5c dis.)	.65	2.98
Memphis, Tenn.		2.60
Milwaukee, Wis.	.58¾	2.35
Minneapolis, Minn.	.60½	2.42
Montreal, Canada (sks. 20c ext.)		1.90b
New Orleans, La.		2.40
New York, N. Y.		2.15@2.65†
Philadelphia, Penn.		2.41@2.81†
Phoenix, Ariz.	.82½	3.30
Pittsburgh, Penn.	.54¾	2.19
Portland, Ore.		3.05
San Francisco, Cal.		2.61*
St. Louis, Mo.	.57½	2.30
St. Paul, Minn.	.60½	2.42
Seattle, Wash. (10c bbl. dis.)		2.65
Toledo, Ohio	.61¼	2.45

NOTE—Add 40c per bbl. for bags.
*5c cash disc. 10 days.
†Prices to contractors, including bags.
(b) Less 10c 20 days.

Mill prices f.o.b. in carload lots, without bags, to contractors.

	Per Bag	Per Bbl.
Buffington, Ind.	.48¾	1.95
Concrete, Wash.		2.60
Dallas, Texas		2.05
Fordwick, Va.		2.05
Hannibal, Mo.		2.05
Hudson, N. Y.		2.05
Kingsport, Tenn.		2.05
Leeds, Ala.		1.95
Louisville, Ky.		2.45
Northampton, Penn.		1.95
Steelton, Minn.	.50	2.00
Universal, Penn.	.48¾	1.95

Cement Products

Hawthorne tile, carload lots, f. o. b. plant, Ogden avenue, Cicero, Ill.:

	Per sq.
Red French	9.00
Green French	11.00
Red Spanish	12.00
Green Spanish	14.00

	Red	Green
Ridges	.25	.35
Hips	.20	.30
Ridge closers	.05	.06
Hip terminals, 2 way	1.25	1.50
Hip starters	.50	.60
Gable finials	1.25	1.50
Gable starters	.20	.30
End bands	.20	.30
Eave closers	.06	.08

Gypsum Products—CARLOAD PRICES PER TON AND PER M SQUARE FEET, F. O. B. MILL

	Crushed Rock	Ground Gypsum	Agricultural Gypsum	Stucco Calcined Gypsum	Cement and Gauging Plaster	Wood Fiber	White Gauging	Sanded Plaster	Keene's Cement	Trowel Finish	Plaster Board ¼x32x36" Weight 1500 lb. Per M Sq. Ft.	Plaster Board ¼x32x36" Weight 1850 lb. Per M Sq. Ft.	Wallboard, ⅜x32 or 48" Lengths 6'-10", 1850 lb. Per M Sq. Ft.
Agatite, Texas (a)			6.00	10.00	10.00	10.50	10.00		19.00				
Akron, N. Y. (a)	3.00	4.00	6.00	10.00	10.00	10.00	20.20	7.00@9.00	27.35	21.00	19.375	20.00	30.00@32.00
Blue Rapids, Kans. (a)	2.50	4.00	6.00	10.00	10.00	10.50	10.00		23.15	19.00	19.375	20.00	
Denver, Colo.				11.80									
Douglas, Ariz.			7.00		16.50		19.50			15.50			
Ft. Dodge, Iowa (a)	2.50	4.00	6.00	10.00	10.00	10.50	15.45		22.70	20.00	19.375	20.00	30.00
Grand Rapids, Mich.	2.75*	6.00†	6.00†	9.00‡	10.00‖	10.00‖							
Gypsum, Ohio (a)	2.75	4.00	6.00	10.00	10.00	10.00	19.25	7.50	26.85	19.00	19.375	20.00	30.00
Port Clinton, Ohio	3.00	4.00	6.00	8.00	9.00	9.00		7.00				20.00	30.00
Portland, Colo.				10.00									
San Francisco, Calif.			10.15										
Winnipeg, Man.	5.50	5.50	7.00	13.50	15.00	15.00					28.50		35.00

NOTE—Returnable Bags, 10c each; Paper Bags $1.50 per ton extra (not returnable).
*To 3.25; †to 8.00; ‡to 11.00; ‖to 12; (a) prices are net of bags.

New Machinery and Equipment

Bucyrus Company Announces Another Diesel Shovel and Dragline Excavator

A FURTHER addition to its line of Diesel shovels and dragline excavators has recently been announced by the Bucyrus Co., South Milwaukee, Wis. This machine, which is the largest of the company's three small revolving machines, is known as the 50-B. In dipper capacities and working ranges this machine is similar to its 50-B steam shovel and dragline. As a shovel it carries a 1¾-yd. dipper, and may be had with standard high-lift or extra high-lift booms, adapting it to a broad range of conditions. As a dragline it may be had with a variety of boom and bucket combinations, ranging from a 45-ft. boom with a 1½-yd. bucket to a 60-ft. boom with a ¾-yd. bucket. As is the case with the steam machine, it may also be had with crane or clamshell bucket equipment.

The Bucyrus Co. is the only manufacturer to equip shovels with straight Diesel engine. The fuel economy and the adaptability of the engine to excavation service render the Bucyrus Diesel machines one of the most valuable contributions that has been made to excavating machinery for years.

The Diesel engine is the result of 20 years of engine builders' experience. The Atlas-Bucyrus engine, with which all three sizes of these machines are equipped, has been in operation on shovels and draglines in quarries and other excavation work in all parts of the world. Its performance under these varying conditions has been uniformly remarkable from all accounts received.

Its power characteristics are similar to that of the steam engine which for many years has been considered the ideal power unit for a steam shovel or a dragline excavator. The 50-B is powered with a mechanical injection, four-cycle, four-cylinder, slow-speed, heavy-duty 9x12 engine, running at a conservative speed of 300 r.p.m. The makers say that this engine was developed particularly for excavating service and is especially rugged, has large bearings, extra heavy crank shaft and connecting rods and extra heavy flywheel and rigid base. It is felt that this machine will supply a long-felt want for many types of excavation, especially where fuel is difficult to obtain and water is of a poor quality.

The new Diesel shovel which may be converted to a dragline excavator or crane with clamshell bucket. The power characteristics are similar to those of a steam engine

Speed-Reducing Device

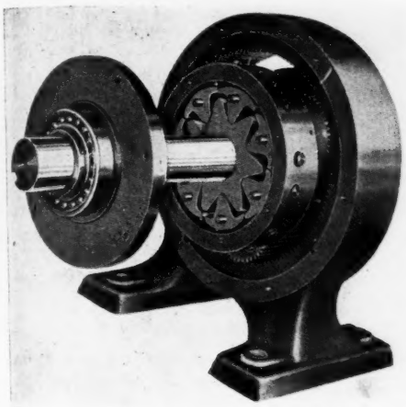
A SPEED-REDUCING device recently placed on the market by the Meachem Gear Corporation, Syracuse, N. Y., for use with high-speed turbines and motors is shown in the accompanying illustration.

In this device the load is transmitted from the high speed shaft through planetary gears to a slower rotating annular ring. Inside this ring are connected a number of rockers which engage with a spider keyed to the low-speed shaft. As the driving motor or turbine starts up each of the rockers engaging with the teeth of the spider first compresses a spring plunger, which brings the bottom of the rocker into positive contact with the inside of the annular ring and at the same time brings its side into positive contact with the side of the adjacent spider tooth. It is claimed that during the time required to compress the spring plungers, corresponding to about one-quarter of a revolution, there is practically no load on the turbine or motor, and the load is then transmitted gradually and without starting shock. The spring plungers are intended also to serve to eliminate vibration and backlash, thereby assisting quiet operation.

The low-speed shaft to which the spider

is keyed is supported on both sides of the spider. The pinion on the high-speed shaft is permitted to float and adjust itself to the proper position between the planetary gears, thus preventing side strains or unequal stresses.

The speed reducer is entirely inclosed, providing dust-proof and fool-proof construc-



Meachem speed reducer with covers removed

tion, and rotating parts run in oil, with forced lubrication above 1800 r.p.m. The device may be applied either to step-up or step-down speed change, and is available in ratios from 4 to 1 to 200 to 1 and for loads up to 500 hp.

New Plymouth Gasoline Locomotive

THE Fate-Root-Heath Co. (Plymouth Locomotive Works) Plymouth, Ohio, have just brought out a new gasoline locomotive illustrated above, known as Model DLC, Type 6, weighing eight tons.

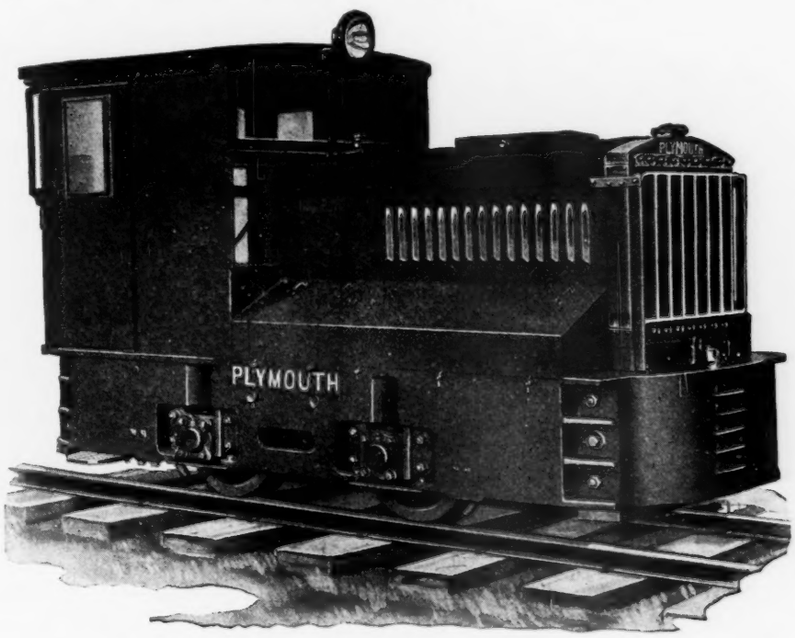
According to the manufacturers' description, this locomotive is equipped with Climax model TU 4-cylinder engine, 5½-in. bore by 7-in. stroke, developing 65 hp. at 900 r.p.m.; Bosch high tension magneto with impulse coupling; Simms 12 volt starter and Willard storage battery; Stromberg carburetor; United air cleaner and built-in governor. The cooling is by a Modine sectional core radiator and a 22-in. gear driven fan and the radiator is protected by heavy guard.

The transmission is the well-known Plymouth sliding gear type, 4-speed forward and reverse. Axles are of alloy steel, heat treated and of extra large diamter (4 7/16 in.) The wheels are of rolled steel, 24-in. diameter. Brakes are of the lever type to all four wheels and sand, by a hand lever may be fed to all four wheels.

This locomotive is built with high cab, the height over all being 84 in., enabling the operator to see over industrial cars. The cab is provided with side entrance, with sliding steel doors, avoiding the danger from going out between the locomotive and a car, as is necessary in the case of a rear opening only.

Speeds are 2½, 4, 8, and 12 miles per hour, at an engine speed of 900 r.p.m. The draw bar pull, at 2½ m.p.h. with sand, is 6000 lb., at 4 m.p.h., with sand 4800 lb.; without sand, 4000 lb.; at 8 m.p.h., 2400 lb.; at 12 m.p.h., 1600 lb.

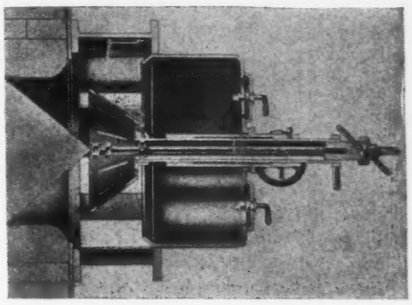
The manufacturers say that this model was given lengthy workouts under decidedly trying conditions during the course of its development, and hence they feel justified in recommending it for any work within its range.



New model Plymouth locomotive, weighing eight tons. It is 84 in. overall in height and the cab is provided with a side entrance so that operator does not have to go between the locomotive and a car

New Oil Burner

FUEL oil burners of the mechanical type, originally developed for the marine field, are constantly attracting more interest in the industrial field. Because of this, there is a marked turning among burner



Section of "Dahl" mechanical oil-burning system

makers to the industrial field, and, their appliances are giving very satisfactory results there.

One of these burners is that made by the Bethlehem Shipbuilding Corporation, Ltd., Bethlehem, Pa. This is called the "Dahl" mechanical oil-burning system. The complete system consists of the burner, furnace front, oil heater, pump, pump governor, suction strainer, discharge strainer, air chamber, inspection tank and the necessary pressure gages, thermometers and relief valves.

The burner proper consists of a tip of special design mounted on the end of the burner pipe, which extends into the furnace front through an adjusting pipe. On the end of the adjusting pipe toward the furnace is a cast-iron cone or deflector of a size depending on the type of furnace front installed. This cone can be adjusted by moving in or out to the position where the flame will receive the proper amount of air for perfect combustion.

The burner is shown in the accompanying cut, fitted to a Bethlehem furnace front with positive air control. The operator can regulate the supply of air exactly by adjusting the area of the air inlet. This is accomplished by means of a rack-and-pinion attachment fitted with a hand-wheel, by which the register check can be positioned for the admission of the required volume of air.—*Chemical and Metallurgical Engineering.*

Stone for Durability

STONE for Durability is a well bound and printed pamphlet issued by the Pennsylvania Stone Producers Association. Its purpose is to show the advantages of limestone as an aggregate in concrete highways and as material for water bound and bituminous macadam roads. There are excellent tables of specifications and quantities required for the different sorts of roads and a number of photographs.

Hearing on Kelly's Combination Sand and Gravel Rates

CANCELLATION of the combination rule on sand and gravel from points on the Chicago & Northwestern and the Chicago, Milwaukee & St. Paul to points in Wisconsin, Illinois and east of the Illinois-Indiana state line are attacked in I. and S. 2236, heard before Examiner McGrath at Chicago November 6.

Walter J. Kelly, member of the auxiliary committee of the C. F. A., testified that, in his opinion, the lawful rate basis of rates, where no through rates applied and where there was no reference to the combination rule, was the full combination of locals. He gave the history of the combination tariff showing that the commission had intended it to apply only where, in the lines' published tariffs, specific mention was made of the combination tariff. He said it was the commissions' intention that some points were to be omitted, and that, in his opinion, it was illegal to apply the combination tariff if the tariff making the rates did not specifically refer to it.

A. F. Cleveland, for the Northwestern, said it was pursuant to the desire of the commission that the tariffs under suspension were published, because the commission had repeatedly asked the roads to get rid of as many references to the combination tariff as possible.

He said he knew of no movement of sand and gravel over his line from the points involved to points east of the Illinois-Indiana state line. He said his line was willing to establish joint through rates on interstate traffic to points east of the line to which a movement of any size and regularity could be shown. He said the rates would be on the same basis as the protestant was contending for.

Frank Lane, for the Janesville Sand and Gravel Co., and A. S. Sorenson, of the Attwood-Davis Sand and Gravel Co., testified as to the volume of their shipments into the territory involved and said they were unable to know far enough ahead just where a job was going to be in order to apply for the joint through rates. They said that if the combination tariff were not to apply, they did not know how they would be able to quote prices or to make bids.

B. H. Atwood, representing the Racine Crushed Stone Co., the Liberty Lake Gravel Co., the Interstate Gravel Co. and the two previously mentioned protestants, testified as to a number of large orders on which shipments were now in progress, the freight charges for which would be increased 30 cents a ton if the cancellation of the combination rule were allowed to go into effect.

W. G. Stanton, for the Eau Claire Sand and Gravel Co., said he was not opposed to the cancellation, if the through rates that would be put in effect were no higher than the rates on that basis.—*Traffic World.*

Freight Rates on Texas Sand and Gravel

THE railroad commission of Texas has considered the application of H. T. Farrell of Plano for a readjustment of rates on sand, gravel and clay, in carloads, from pits of applicant on the Texas & Pacific railroad to Dallas and to all other stations on lines of railway in the state. Applicant asked establishment of the following rates:

From Clowdy, Texas, to Dallas, $12 per car.

As an alternative for the $12 per car rate from Clowdy to Dallas a rate of $15 per car to apply from Farrell's gravel pit to Dallas, with an allowance of $3 per car to accrue to the applicant to cover switching between Clowdy and his gravel pit.

From Clowdy, Texas, to all other stations in Texas regular mileage rates to apply, subject to rates from Dallas, as maxima.—*Dallas News.*

Some Prices on Minnesota Highway Building

AUTOMOBILE taxes are spreading out more miles of grading and graveling, also building many new trunk routes in many parts of the state under new contracts being now awarded to low bidders by C. M. Babcock, state highway commissioner. The new list includes 92 miles of grading, 54 of graveling and numerous bridges and concrete culverts. The low bids aggregate $429,000, a total well below that of preliminary estimates. Sharp competition among many road contractors, a large percentage of whom are located in the smaller cities and towns of Minnesota, brought low prices generally. Unit prices went as low as 11½ cents a yard mile on gravel hauling, 22 cents a cubic yard on excavating and $16.50 a cubic yard on concrete.

The projects are quite widely distributed over the 7000-mile highway system.

While all the trunk highway improvements must be paid for eventually with motor vehicle tax funds, it was officially explained, most of those listed are made possible now by county reimbursement bond issues. All interest on such bonds already is being paid from the automobile tax receipts and a sinking fund of more than $2,000,000 has been accumulated to date toward paying the obligations, most of which run from 10 to 20 years longer. The interest is offset partially by that collected on sinking fund balances at 4½% annually, also by reduced maintenance expense following improvements and most by the earning power of better highways, it was pointed out.—*St. Charles (Minn.) Press.*

Los Angeles Rock and Gravel Company Wins Two of Its Suits Against City

THE fight of the Los Angeles Rock and Gravel Co. to retain its right to crush rock taken from the Arroyo Seco in Los Angeles has been hotly contested by the city and notices of suit and counter-suit have been published in ROCK PRODUCTS from time to time. The latest report, from the *Los Angeles Herald*, shows that the company has won two of its suits and had the third continued.

"Two of the three suits involving the right of the Los Angeles Rock and Gravel Co. to excavate in the Arroyo Seco were decided by Judge Victor R. McLucas in favor of the corporation and the city of Los Angeles was restrained from interfering with the work.

"The third case in which the city asked that the company be ordered to stop work on the ground it was a nuisance to the nearby residents was continued.

"Judge McLucas had held that under the evidence adduced during the trial of the cases and the authorities before him, he would be obliged to decide that the city ordinance prohibiting excavations in the Arroyo were unconstitutional. Under one supreme court decision it was held that excavating might be regulated but not prohibited, and Judge McLucas concurred, but he gave C. B. McCoy, deputy city attorney, additional time to submit other authorities before giving a final decision.

"This ruling would not affect the question of the work being done by the gravel company as being a nuisance and other points involved in the litigation, which involves more than $1,000,000 in property in the bed of the Arroyo.

"It was contended by the rock and gravel company and its counsel, C. H. Mattingly and Guy Eddie, that to prohibit excavating would be tantamount to confiscating the property, as the rock and gravel represents the chief value of the property to private interests.

"Efforts have been made by the city to purchase the land for park and boulevard purposes, and plan is now under way to condemn portions of the Arroyo for public use."

Missouri Highway Contracts

CONTRACTS totaling $312,101.45 for road work in the state were approved at a recent meeting of the Missouri State Highway Commission, according to local papers.

Charge Rate Discrimination

DISCRIMINATION in rates on sand and gravel was charged by the Summit Sand and Gravel Co. against the Duluth & Iron Range railroad at a hearing before the state railroad commission recently.—*Duluth Herald.*

News of All the Industry

Incorporations

P. M. O'Neil Gypsum Co., Montreal, Canada, manufacturer of plaster, has been registered.

Jackboro Crushed Stone Co., Jackboro, Texas, has been incorporated for $75,000 by L. P. Lively, Hal Moseley and W. W. Hyde.

Molding Sand Co., Albany, N. Y., has been incorporated for $10,000 by M. P. Davis and A. R. Fox. (Attorney, H. H. Davis, Albany.)

Cement Products Co., Lakeland, Fla., has been incorporated for $10,000. Tom Contner, president; A. M. Davis, secretary-treasurer.

Baltimore Sand and Gravel Co., Baltimore, Md., has been incorporated by John W. Ritter, Frank D. Carozza and Clyde H. Wilson.

Oklahoma City Flint Co., Oklahoma City, Okla., has been incorporated for $10,000 by J. H. Gwin, E. L. Wyatt and C. M. Gwin.

Red Stone Co., Louisville, Ky., has been incorporated for $15,000 by Brent Altsheler, 112 East Ormsby street, Summers Dean, and others.

Gull Bar Sand and Gravel Co., Toledo, Ohio, has been incorporated for $10,000 by Frank D. Lamb, Harry G. Lamb, and C. M. Collins.

Carriere de Rosemont, Ltee (Rosemount Quarry, Ltd.), Montreal, Canada, has been incorporated for $20,000.

Ambrose Sand and Gravel Co., Bonham, has been incorporated for $10,000 by D. M. Penn., H. A. Cunningham and C. T. Aspelmier, Cedar Rapids, Iowa.

Port Angeles Concrete Products Co., Port Angeles, Wash., has been incorporated for $20,000 by R. O. Howard, W. F. Paddock and Fred C. Strange.

Crisman Sand Co., Crisman, Ind., has been incorporated for $10,000. Directors: Nels Nicholson, Samuel Nicholson, Herbert D. Scofield, Robert D. Kilvary and Edgar D. Sargent.

Freeland Stone Co., Sellersburg, Ind., has been incorporated for $40,000 to quarry and crush limestone. Directors: Myron Freeland, Paul E. Freeland and Emma F. Freeland.

S. A. White Co. has been incorporated under the laws of Delaware for $100,000 by Charles G. Guyer, 901 Orange street, Wilmington, Del., R. T. Kenton and S. E. Phillips, Wilmington, Del.

Washingon Marble and Mining Co., Seattle, Wash., has been incorporated for $1,000,000 by Frank Oleson, P. A. Johnson, Peter M. Moe, A. Mathisen and Hilmar Westwold.

Central Concrete Co., Indianapolis, Ind., has been incorporated for $5000 common and $10,000 preferred, to manufacture concrete. Directors: Samuel E. Smith, Fred B. Robinson and Roscoe F. Lee.

Conrad Cast Stone Block Co., R. R. 10, Ft. Wayne, Ind., has been incorporated for $20,000 to manufacture building materials. Directors: Albert L. Miller, Floyd A. Conrad, and Henry A. S. Levering.

Coe Hill Granites, Ltd., with head office at Toronto, Ontario, Canada, has been incorporated for $150,000 by Thomas Morrison, William Morrison, Joseph Morrison, J. P. Connolly, and J. F. Ganley, all of Toronto, to operate stone, granite, and marble quarries, etc.

Prime Cement Block Manufacturing Co., Brooklyn, N. Y., has been incorporated for $20,000 by J. Brenner, 302 Marcy avenue, Brooklyn; J. Goebel, 235 Amherst street, Brooklyn, and G. W. Miller, 291 Broadway, New York City. (Attorney, N. C. Helman, 41 Park Row, New York City.)

Correction

In an item in the November 1 number of Rock Products Charles Nathan Mitchell was given as the president of the newly incorporated Turtle Island Crushed Stone Co., Cohasset, Mass. This was an error; the president is Nellie W. Mitchell.

Sand and Gravel

Union Rock Co., Los Angeles, Calif., will build new rock bunkers to cost approximately $5700.

Wayne County Sand and Gravel Co., 521 Stevens building, Detroit, Mich., has increased its capital stock from $25,000 to $75,000.

Ohio River Gravel Co., Wheeling, W. Va., will soon commence the erection of a distributing plant at Marietta, Ohio, the company having made application for a permit.

C. C. Fleshman, Turlock, Calif., has established a sand, gravel and rock plant at Cressey, Calif., with a capacity for 150 to 200 tons per day.

M. E. Maney, Houston, Texas, and associates will establish a sand and gravel plant on the Colorado river, near Smithville, Texas, which will include a motor-driven shovel with a capacity of 30 to 40 cars per day.

Nebraska City, Neb.—Reports state that a new gravel pit has been discovered two miles west of Union, Cass county, on the O street highway. The deposits comprise about 14 acres and are from 10 to 20 feet deep.

Memphis, Tenn.—Nonconnah creek, south of the city, long used for watering cattle in the summer, is believed to contain an extensive sand and gravel deposit, according to reports, which state that a group of business men are working the deposit. A homemade washing and screening plant has been erected, with virgin timbers used for props and underpinning.

Arkadelphia, Ark.—Reports state that William Gravson, Jr., of St. Louis, has made arrangements with the Missouri Pacific railroad to run a spur track from the Arkadelphia station to a point nearly two miles south on the Ouachita river, where a big gravel washing plant will be installed. It has been estimated there are 1,000,000 cu. yd. of gravel in the bar suitable for commercial purposes.

Y. M. Yeldell, Monticello, Ark., celebrated the opening of his gravel pit a few weeks ago by giving a luncheon. This pit is said to contain one and one-quarter million yards of gravel that is suitable for road building. A spur from the A. D. & N. railroad was constructed three-quarters of a mile to the pit and loading out the gravel was started recently. The gravel is said to compare favorably with the Benton county gravel.

Quarries

Spar Mining and Milling Co., Toronto, Ontario, Canada, is having plans prepared for the erection of a mill at Lakefield, Ont., for milling nonmetallic minerals. F. Robertson is engineer.

Lafayette Fluorspar Co., Marion, Ky., is contemplating the construction of a new mining and milling plant for commercial fluorspar production. The estimated cost will approximate $100,000 with machinery.

Carrara Marble Quarry, near Pine Grove, Calif., is in operation. The company is now working on a ledge of white marble, but also has a ledge of blue marble which has been opened up for more than 150 ft.

New York Trap Rock Co., headquarters at 101 Park avenue, New York City, has placed a contract for a second section of its plant at Peekskill, N. Y., with the Burrell Co. of New York City.

France Stone Co.'s North Baltimore, Ohio, plant will install new machinery for making a smaller-sized road stone than most of that turned out. There is an increased demand, it is stated, for the smaller sizes in road work, railroad ballast, concrete work, etc.

Zenith Limestone Co., Tulsa, Okla., is reported as having commenced operations recently on the site of the old Tulsa Portland Cement Co.'s holdings, near Price, Okla. R. D. Long and associates are owners of the company which is said to have an investment at Price of about $400,000. Three large crushers have been installed.

Bluffton Stone Co. has removed its general offices from Lima to Findlay, Ohio, this change being made, as the company owns the Hancock Stone Co. and operates plants at Findlay, Bluffton, Arlington, Rimer and Lewisburg and the new location will be more centrally located. The company will maintain a district sales office at 410 Opera House building, Lima, Ohio.

Samuel Oliver, chief owner of the stone quarries of the Oliver & Rogers Co., Ninth avenue East, Owen Sound, Ontario, Canada, was killed recently with two of his employes when a heavy charge of dynamite exploded prematurely. Mr. Oliver was putting the explosive in two holes and the two employes were tamping them when the charge went off.

Huntsville Stone and Crushing Co., Huntsville, Texas, is delivering five cars of crushed rock per day to Smith Brothers, who are paving Huntsville streets. Shipment will begin shortly on a federal contract for 50,000 tons of large rock to the Galveston jetties. The quarry is eight miles north of town at Rock Mountain, where there is said to be a rock supply for 25 years' crushing. The company has a large crushing machine and operates its own spur track which connects with the Oakhurst Lumber Co. railroad to Huntsville. David M. Pictor & Co. of Port Arthur operate the quarry. The capacity at present is 30 cars per day.

E. T. Swenson and **H. F. Rhoades**, Bentonville, Ark., both of route 3, have purchased from Stokes & Blood the limestone crusher which the latter firm has been operating at the old lime kiln near Bentonville. Possession was given the first of November, after Stokes & Blood had filled the contracts they had had. Messrs. Swenson and Rhoades will move the crusher to the Swenson farm north of Centerton, where there is said to be a bluff of 98% pure limestone nearly a quarter of a mile long. The new owners will crush limestone for use on their own farms and will doubtless also furnish this valuable land builder to neighboring farmers.

Agstone

Ardmore, Okla.—Pulverized limestone for the farms of Carter county is being advocated by the farm agent here, following an investigation of the deposit of the material in the Arbuckle mountains, which is reported to be the finest in the state. The matter will be taken up with the county commissioners and the highway department relative to obtaining the material. It is stated that sufficient to supply the county in a short time is available.

Lime

Holmes Lime and Cement Co., 425 Kearney street, San Francisco, Calif., is about to build a three-story frame sand bunker and a plaster tank tower at DeHaro and Division streets, to cost about $10,000.

Superior Lime and Hydrate Co., Pelham, Ala., is completing arrangements for the construction of an ice-manufacturing plant and will place orders for primary equipment at once. It has work under way on extensions in its lime plant to include the installation of two additional kilns and auxiliary machinery. H. G. Bridgewater is general manager.

Cement

San Antonio Portland Cement Co., San Antonio, Texas, is reported as having plans prepared for the construction of 10 slurry tanks 20 ft. in diameter and 40 ft. high, to cost about $75,000.

Texas Portland Cement Co., Houston, Texas, entertained the members of the Houston Purchasing Agents' Association at a luncheon at the plant recently, where the guests were shown how cement is made from oyster shells.

International Cement Corp., with headquarters at 342 Madison avenue, New York City, will issue its third quarter report shortly and it is expected that it will compare favorably with the results for the same period in 1923. In the full year 1923, cement had a net profit of $6.37 a share on its common stock. Current calculations are that the net income applicable to the common for all of 1924 will be about $7 a share.

Gypsum

United States Gypsum Co., with headquarters in Chicago, Ill., has increased its capital stock in Virginia from $18,000,000 to $20,000,000.

Slate

Harding, Hoefleck & Foulke, Slatington, Penn., have leased the property formerly operated by the

Empire Slate Co., Slatesdale, near Slatington, Penn. Extensions and improvements are planned, with the installation of new equipment.

Cement Products

Concrete Pipe and Products, Ltd., Hamilton, Ont., Canada., has sold its plant.

Bottler and Bennett, 14 Napa street, Spokane, Wash., are erecting an 1800 block factory in Spokane.

Cement Products Co., Spencer, Iowa, has had its tile factory damaged by fire to the extent of about $50,000, reports state.

Anchor High Test Hollow Tile Co. of Atlanta, Ga., has begun the construction of a plant consisting of five buildings in Bartow, Fla., to have a daily capacity for 3000 cement building blocks.

Kauffman Construction Co., First street and the river, Denton, Md., suffered the loss of its cement block plant through fire recently, according to reports received.

Staten Island, N. Y.—The property fronting on Kill von Kull and on Bank street about 125 ft. has been acquired for the manufacture of cement, brick and roof tiles by a new process and for the handling of building materials, according to reports.

Silica Sand

Capstan Glass Co., Connellsville, Penn., has awarded the Austin Co., Cleveland, Ohio, contract for two new factory units. These will be one- and two-story buildings, providing 100,000 sq. ft. of floor space and will contain a machine shop, furnace, shipping and other departments.

Rock Asphalt

Garfield Rock Asphalt Co., Starks building, Louisville, Ky., has purchased about $30,000 worth of machinery for development of 300 acres of rock asphalt deposit near Garfield, Ky., and plans the construction of a traction line from the mine to Garfield.

Magnesite

Calcined Grecian magnesite was recently reported Rock Products, by a prominent New York importer, at $45 a net ton f. o. b. cars New York. The material is quoted as fine ground, light in color, and packed in 600-lb. bbl.

Oil Shale

Stevens, Inc., Rome, Ga., of which Walter S. Stapler is president, has leased 120 acres of shale deposit and will develop.

Feldspar

International Feldspar Co., Ltd., Buckingham, Que., Canada, manufacturer and distributor of feldspar and quartz products, has acquired a tract of land in the west end of Ogdensburg, N. Y., upon which it is planned to erect a modern branch plant to supply the United States trade.

Personals

T. B. H. Askin has been appointed by the American Manganese Steel Co., Chicago Heights, Ill., sales manager for the Intermountain division, with headquarters at the Denver, Colo., office.

Howard J. Wittman, 632 Nasby building, Toledo, Ohio, has been appointed district representative of the Kuhlman Electric Co., Bay City, Mich., with northwestern Ohio as his territory.

Karl Koerper, advertising manager of the Ash Grove Lime and Portland Cement Co. of Kansas City, Mo., recently addressed the class in advertising copy, on the London convention of the Advertising Clubs of the World.

Howard B. Hoel has resigned as general sales manager of the Greenville Gravel Co., Greenville, Ohio. Pending reorganization of the sales department, all matters heretofore handled by the sales manager will be taken care of by the general management at Greenville.

Glenn D. Evans, for many years connected with the J. F. Buhr Machine Tool Co., has again joined the Buhr organization in the capacity of chief engineer. Mr. Evans was the chief engineer of the Climax Engineering Co. of Los Angeles for the last three years.

John F. Putnam has been promoted to the general managership of the National Silica Co. of Chicago and Oregon, Ill., of which he has been Oregon manager the last 10 years. He will fill the position made vacant by the death of William Stevenson of Chicago.

N. P. Farrar has been appointed assistant sales manager of the Pawling & Harnischfeger Co., Milwaukee, Wis. Mr. Farrar has been district manager of the Philadelphia territory for this company until recently and has had considerable experience with overhead electric traveling cranes, hoists, and gasoline powered excavators.

H. L. Mode has been appointed by the Pawling & Harnischfeger Co., Milwaukee, Wis., its sales representative in the eastern territory with headquarters at New York and Philadelphia. Mr. Mode has had 10 years' experience in work with overhead electric traveling cranes, as well as seven years experience in the motor department of the General Electric Co.

Thomas K. Scott has been appointed Mid-West sales manager of the Taylor-Wharton Iron and

Thomas K. Scott

Steel Co. He will be located at Denver, Colo., in charge of the sales district of which Denver is headquarters. Mr. Scott is a graduate of the Columbia School of Mines and has had a wide and profitable experience in mining, having been associated with the Cumberland Ely Copper Co., of Nevada, the Inspiration Copper Co., and the Miami Copper Co. He was chief mining engineer of Miami up to the time of his resignation last August.

Obituary

R. F. Whale, president of the Waupaca Sand and Gravel Co., died suddenly at his home at Waupaca, Wis., following a paralytic stroke.

Manufacturers

Diamond Power Specialty Corp., Detroit, Mich., manufacturer of the Damond valve-in-head soot blower, will have an exhibit at the Mechanical Engineering Power Show, Grand Central Palace, New York City, December 1 to 6.

Foote Bros. Gear and Machine Co., Chicago, Ill., announces that it will give an interesting display of spur- and worm-gear speed reducers at the National Exhibition of Power and Mechanical Engineering to be held at the Grand Central Palace, New York City, December 1 to 6.

Austin Co. of California announces the removal of its San Francisco office to enlarged quarters at 244 Kearny street. Recently the headquarters' staff of the Austin Co. of California, at Los Angeles, moved into its new home at 777 East Washington street.

Detroit Stoker Co., Detroit, Mich., manufacturer of single and multiple-retort underfeed and V-type stokers, will have full-sized underfeed stokers in operation as an outstanding feature of its exhibit at the Mechanical Engineering Power Show, Grand Central Palace, New York City, December 1 to 6.

Westinghouse Electric and Manufacturing Co., East Pittsburgh, Penn., has purchased the Milwaukee plant of the Massey Concrete Products Corporation. This purchase was confined to the Hollowspun concrete post department of the Massey corporation and in no way affects its activities in its other 12 plants.

Kuhlman Electric Co., Bay City, Mich., has appointed the Globe Electric Supply Co., 1843 Wazee street, Denver, Colo., district representative, the territory involved including Wyoming, Colorado and New Mexico. The Kuhlman company expects to have a stock of transformers placed shortly with this new representative.

Jean M. Allen & Co., engineers and contractors, have removed their offices from 53 West Jackson boulevard, Chicago, Ill., to 841 Maison Blanche building, New Orleans, La. The company announces that it has made arrangements with the **Bates Engineering Works**, 2270 Clybourne avenue, Chicago, to continue the manufacture of the Allen company's line of ladders, cutters, hoists, and hydraulic dredge specialties, all inquiries for which should be addressed to the Bates company.

Foote Bros. Gear and Machine Co., 215 North Curtis street, Chicago, Ill., is now erecting a new addition to its plant with an entrance on Lake street. The new building is to be used for shipping, receiving and raw material storage. The company announces that it has recently completed arrangements with the Canadian firm of Darling Bros. for the exclusive distribution of their IXL gear products and speed reducers throughout the Dominion of Canada. The home office of Darling Bros. is in Montreal and they maintain branch offices in Windsor, Toronto, Winnipeg, Halifax, Ottawa, Vancouver and Quebec.

Trade Literature

Denver Rock Drill Manufacturing Co., Denver, Colo. Bulletin 70-A, describing Waugh stopers Models 773, 773W, 774 and 774W.

Travelers Insurance Co., Hartford, Conn., is issuing an interesting booklet on group insurance which is beginning to be used, to some extent, in the rock product industries.

William Ganschow Co., 1001 West Grand boulevard, Chicago, Ill., has just issued a folder illustrating and describing its speed transformers. Installation photographs are given showing some of the many industries in which these transformers are used.

Brown Instrument Co., Philadelphia, Penn., is sending out a mailing piece illustrating this company's line of instruments, such as pyrometers, recording thermometers, pressure gages, electric CO_2 meters, etc. A post card is attached for the convenience of those interested.

Dust Recovering and Conveying Co., Cleveland, Ohio. Bulletin 505, revised, on a "Dracco" pneumatic conveying installation, describing the conveying of lithophone from crushers to fine grinders in a chemical plant. This system is used also in conveying ground phosphate rock, hydrate of lime, etc.

Shepard Electric Crane and Hoist Co., Montour Falls, N. Y. New 60-page book on floor-operated electric hoists. This piece of literature has been compiled with much care and thought and has been arranged in such a way that it can be easily followed. Each type of the company's floor-operated hoist is described, an installation and a portrait view of the hoist are given followed by drawings and dimensions, and there is complete information regarding capacities, heights of lift, prices, etc.

Westinghouse Electric and Manufacturing Co., East Pittsburgh, Penn. Circular 1676 on a new and complete line of interchangeable pipe fittings for structural work. This 36-page two-color publication describes these fittings and gives their application to such work as the erection of outdoor substations, switching equipment, switchboard frames, racks, railings, fences, etc. It contains a large number of halftones, supplemented by dimensional drawings, making the publication useful as a reference book for the designer of such structural work. An adjustable insert for fastening machinery or other equipment to concrete floors, walls or ceilings, another new Westinghouse product, is also described and pictured in the publication.

Vulcan Iron Works, Wilkes-Barre, Penn. Kilns, coolers and dryers are illustrated and described in a 24-page booklet recently received from this company. A few illustrations are also given of rotary kilns in the chemical and metallurgical field, but the company has a special booklet devoted to rotary kilns in this field. The Meade improved vertical lime kiln is featured in another circular recently distributed by the Vulcan company, and another circular just issued is a 20-page Bulletin 101, devoted exclusively to the Vulcan worm gear drive gasoline locomotive. In addition to a complete description there are illustrations showing various parts of the locomotive. A four-page leaflet is enclosed giving the rated hauling capacities of all the popular sizes from three tons to 25 tons. Copies will be mailed free to all those interested on request.